

The genus *Ischioscia* Verhoeff, 1928 in Venezuela, with the description of six new species (Crustacea, Oniscidea, Philosciidae)

ANDREAS LEISTIKOW

Universität Bielefeld, Abteilung für Zoomorphologie und Systematik, Morgenbreede 45, D-33615 Bielefeld, Germany and Ruhr-Universität Bochum, Lehrstuhl für Spezielle Zoologie, Universitätsstraße 150, D-44780 Bochum, Germany. e-mail: Leiste@Biologie.Uni-Bielefeld.de

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SYNOPSIS. Terrestrial isopods (Oniscidea) collected in Venezuela in 1998 revealed plentiful material of the philosciid genus *Ischioscia*. This genus was, until very recently, represented in Venezuela by only a single species, *I. variegata* (Dollfus, 1893). The examination of the new samples lead to the description of six new species, all confined to small areas within Venezuela; five of which are closely related to *I. variegata*. These species are described in the present paper and the biogeography of the genus is discussed for Venezuela. The characters, which are important for reconstructing the phylogeny are presented and the relationships of the species are also discussed.

INTRODUCTION

The genus *Ischioscia* Verhoeff, 1928 was one of the first genera of philosciid Oniscidea described from South America (Verhoeff 1928). It was instituted for a species from Venezuela, *I. lobifera* Verhoeff, 1928, which is now considered to be a junior synonym of *I. variegata* (Dollfus, 1893), a species reported from several localities in northern South America (Leistikow 1997). The genus comprises the largest species of terrestrial Isopoda in South America, with *I. variegata* reaching a body length of about 15 mm. Beside this species, several others are reported from the Peruvian and Brazilian Amazon region (Lemos de Castro 1955, Schmalfuss 1980), from Central America (van Name 1926, Arcangeli 1930, Leistikow 1997, 1999 and 2000) and even from the lesser Antilles (van Name 1936). The total number of nominal species now is 16, and it is likely that several others will be found when the vast Amazonas region is better explored. The number of known species increased in those regions where larger collections were made. For example, in Costa Rica, ten species have been discovered in the last decade. The samples from Venezuela dealt with in this study revealed the presence of six more species; most of them close to *I. variegata*, but quite distinct in several characters. Hence, several records of *I. variegata* may show

to belong to other species. The species of *Ischioscia* found in Venezuela are described in detail, the holotypes are deposited in The Natural History Museum, London for which the acronym BMNH is used below. Paratypes are deposited in The Natural History Museum, London, the Muséum d'Histoire Naturelle, Genève (MHNG), Staatliches Museum für Naturkunde, Stuttgart (SMNS), the museum of the University of Maracay, Venezuela (MUMV), and in the collection of the author. The new species belong to the *martinae-variegata*-group of species distributed in Central America and northern South America. Particularly five of the new species are forming a monophylum together with *I. variegata* and *I. panamensis*. They seem to be restricted to smaller areas in Venezuela, and their distribution is compared with those of other taxa.

MATERIALS AND METHODS

Several samples of isopods preserved in 70% ethanol were examined. The samples were checked with a Wild stereoscope and in the case of new species a holotype was selected for preparation. Drawings were made using a camera lucida. Some specimens were dissected and the appendages were mounted on microscopic slides in glycerine gelatine,

the appendages were then drawn using a camera lucida including drawings of the new species. The types selected for museum storage are preserved in 70% ethanol/5% glycerine.

SYSTEMATICS

Ischioscia variegata (Dollfus, 1893)

MATERIAL EXAMINED. 19 males, 11 females (with marsupium), 11 females/immatures: Parque Nacional El Avila 10°34.70'N 66°53.92'W, banana plantation, forest along brook, leg. C. Schmidt 10.3.1998; 3 males, 10 females (with marsupium), (MHNG); 8 females 11 immatures: 10°33.01'N 66°54.41'W Forest with Bamboo, *Heliconia* sp., *Ricinus* sp. among others, gas pipeline crossing under street, small river, under bamboo leaves on sand, gravel, leg. C. Schmidt 11.3.1998; 1 male: Aragua, Parque Nacional Henry Pittier, Mist forest near Estación Biológica Rancho Grande, between leaves of fallen bromeliad, leg. C. Schmidt 14.3.1998; 1 male, 1 females (with marsupium), 1 immature: Aragua, Parque Nacional Henry Pittier, street heading from Rancho Grande to sea shore, near Capilla Virgen del Carmen, Mist forest, brook with cascade, under moist leaf litter and stones, leg. C. Schmidt 15.3.1998; 1 male: Falcón, Parque Morrocoy, Península de Morrocoy, northern shore, Cueva del Indio (carstic cave with crushed ceiling, within detritus in small niches and edges of the rock, under stones on bottom, leg. C. Schmidt 18.03.1998; 3 males, 3 females (with marsupium), 6 females: Sierra de San Luis, 11°07.35'N 69°40.74'W opposite to Cueva San Luis, forest with almost dried out brook emerging from cave, stones litter, Bombacaceae, Piperaceae, mango-trees, under logg, leg. C. Schmidt 20.3.1998; 2 males, 1 females (with marsupium), 2 females: Curimagua 11°11.61'N 69°39.96'W track to Cueva de Lugo, banana plantation, under loggs, leg. C. Schmidt 21.3.1998; 1 female, 3 immatures: Curimagua, Cueva de Lugo 11°11.90'N 69°39.88'W carstic cave without water, moist bottom, at the entrance under stones, leg. C. Schmidt 21.3.1998; 4 males, 3 females (with marsupium), 6 females, 2 immatures: Cueva Acurite 11°10.42'N 69°37.75'W cartic cave with water, surrounded by forest and banana plantation, at the entrance under stones and leaf litter, leg. C. Schmidt 21.3.1998; 3 males, 3 females, 1 immature: Eastern slope of Andes 'La Campana' 8°51.92'N 70°37.14'W 1500 m (+/- 200 m) moist forest (Araceae, Arecaceae, Melostomataceae, Orchidaceae) under leaf litter, leg. C. Schmidt 24.3.1998; 1 male, 1 female: Península de Paria, Puy Puy 10°42.00'N 62°58.05'W bay with sandy beach, coconut palms, surrounded by dry mountains, small westernmost bay, under loggs, coconuts and leaf litter, leg. C. Schmidt 29.3.1998; 1 males, 3 females (with marsupium), 11 females/immatures: Península de Paria, Puy Puy 10°42.00'N 62°58.05'W bay with sandy beach, coconut palms, surrounded by dry mountains, forest at the edge of banana plantation east of bay, in leaf litter, leg. C. Schmidt 1.4.1998; 2 immature males, 1 female (with marsupium): Caripe, surroundings of Cueva del Guacharo 10°10.37'N 63°33.14'W moist forest, under rotting loggs and leaf litter along brook, leg. C. Schmidt 7.4.1998; 1 male: Península de Paria, southern shore of eastern part, 10°34.87'N 63°03.60'W, thermal well with thatched roof, uncovered near water edge; surrounded by meadows with cattle, leg. C. Schmidt 8.4.1998

Ischioscia fasciifrons sp.nov.

Figs 1–4

MATERIAL EXAMINED. Holotype, male (body length 10 mm): Curimagua, 1250 m, under wood in the garden of a hotel, leg. C. Schmidt 21.03.1998.

DESCRIPTION

Colour. Dorsum on a light umber ground colour patched with light spots and a darker medial band running down to the pleon, coxal plates with dark patches, on coxal plates VI and VII extensive dark areas. Cephalothorax with a dark band between the compound eyes on postfrons, profrons with a dark inverted Y covering lamina frontalis, extending ventrally.

Cephalothorax. Vertex flattened with few tricorn-like setae, compound eyes consisting of about 26 ommatidia arranged in four rows. Lamina frontalis and very faint linea supra-antennalis present, linea frontalis lacking (Fig. 1, Ctf).

Pereon. Cephalothorax set back into pereonite 1 coxal plates prominent, with sulcus marginalis, no gland pores or noduli laterales visible in light microscope, tegument smooth, bearing several slender tricorn-like setae, highest density along lateral and distal margins (Fig. 1, Cx3).

Pleon. Set apart from pereon, neopleurae of pleonites 3 to 5 prominent, pleotelson with concave lateral margin, as long as protopodites of uropods.

Antennula. Composed of three articles of subequal length, distal article pointed with several aesthetascs apically and along medial margin, caudal side of proximal article extended (Fig. 1, An1).

Antenna. Broken in the specimen examined, peduncular articles bearing tricorn-like setae (Fig. 1, An2).

Mandible. Pars intermedia with coniform setae, two penicils on left and one on right side, additional plumose seta proximally, molar penicil composed of about 7 branches (Fig. 2, Mdl/r).

Maxillula. Medial endite with two stout penicils apically and small subapical tip, lateral endite with 4+6 teeth apically, 3 of inner set deeply, two slightly cleft, slender subapical tooth and acute hyaline lobe caudally (Fig. 2, Mx1).

Maxilla. Both lobes covered with faint setation, medial trichiae stronger, lateral lobe slightly broader than medial, medial lobe apically cuspidate (Fig. 2, Mx2).

Maxilliped. Basipodite with plentiful cover of tricorn-like setae, sulcus lateralis present, endite caudally setose, rostrally with knob-like penicil, palp with proximal article bearing short and long seta, medial article with short proximal setal tuft, distal tufts slightly stalked (Fig. 2, Mxp).

Pereopods. Pereopods slender (Fig. 3, PE3–7; Fig. 4, PE1), carpus with antenna-grooming brush and ornamental sensory spine with hand-like apex (Fig. 3, Sc1), dactylus with long inner claw and simple dactylar seta, apically slightly tapered (Fig. 3, Dac). Sexual differentiation. Pereopod 1 and 2 carpus enlarged with setal field rostrally, enlargement not too prominent, pereopod 3 with a very small setal field on medio-proximal border of caprus and medio-distal margin of merus. Pereopod 6 ischium with a small depression rostrally near medial margin with sensory spine, pereopod 7 ischium with a slightly twisted medial margin, thus forming a groove rostrally, slight distal lobe with few trichiae.

Pleopods. Pleopod endopodites bilobate, exopodites with about 8 to 9 sensory spines laterally, medially with trichiae and minute pectinate scales, pleopod 5 with caudal creel of three rows of prominent pectinate scales, protopodite 3 to 5 with medial protrusion, less conspicuous on pleopod 4 and 5, rudimental epipodites on pereopod 1 to 4 (Fig. 4, PL1–5). Sexual differentiation. Male pleopod 1 exopodite triangular with lateral protrusion hardly set apart, incision merely a sinuosity, endopodite apically obtuse, with minute spines apically and lateral row of minute spines. Pleopod 2 exopodite elongate with about 12 sensory spines laterally, medially with minute pectinate scales, endopodite longer than exopodite, apex looking like a hypodermic needle.

Uropod. As in other species of the genus.

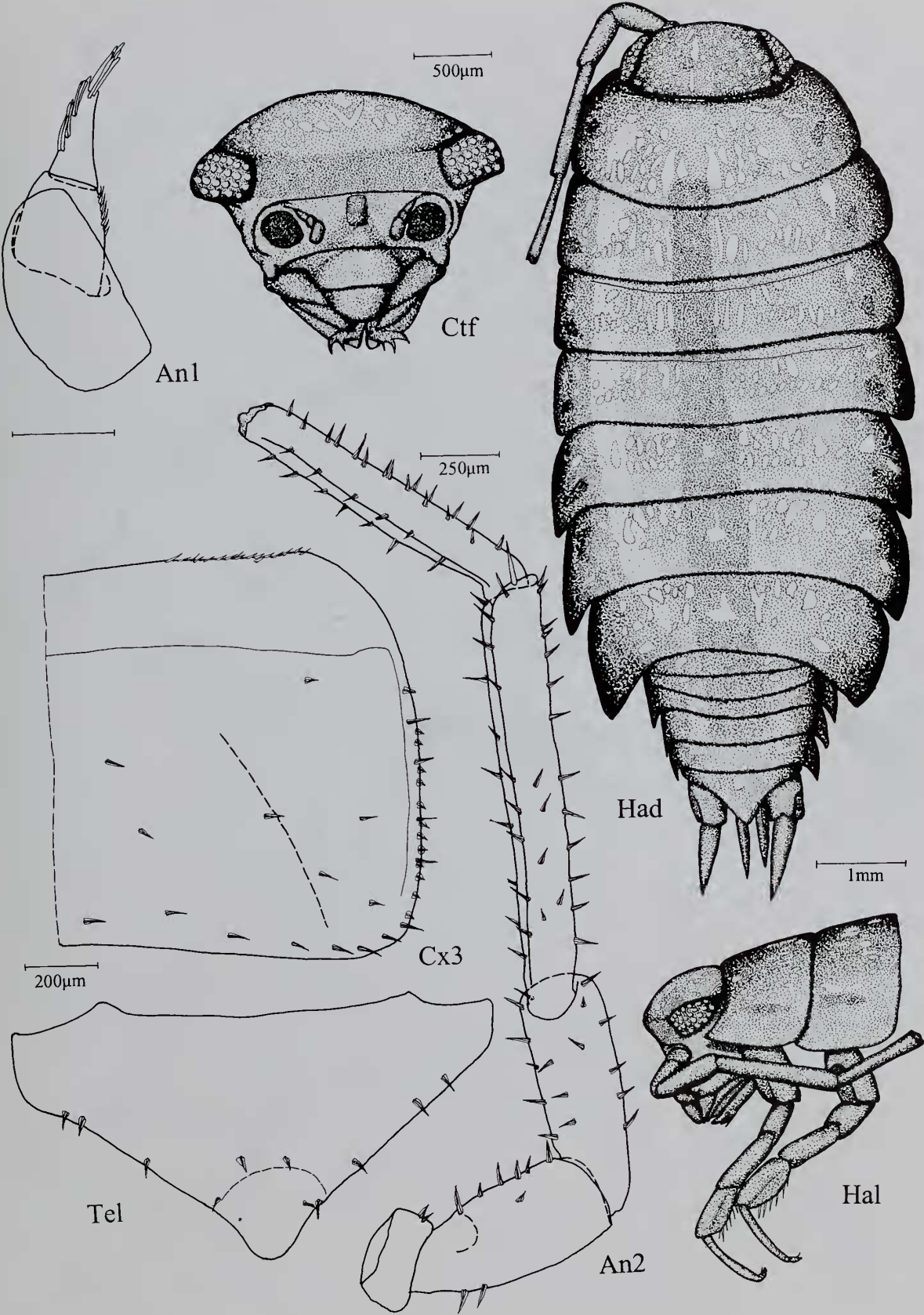


Fig. 1 *Ischioscia fasciifrons* sp.nov. Holotype, male, 10 mm. An1 antennula; An2 antenna; Ctf cephalothorax in frontal view; Cx3 coxal plate 3; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson.

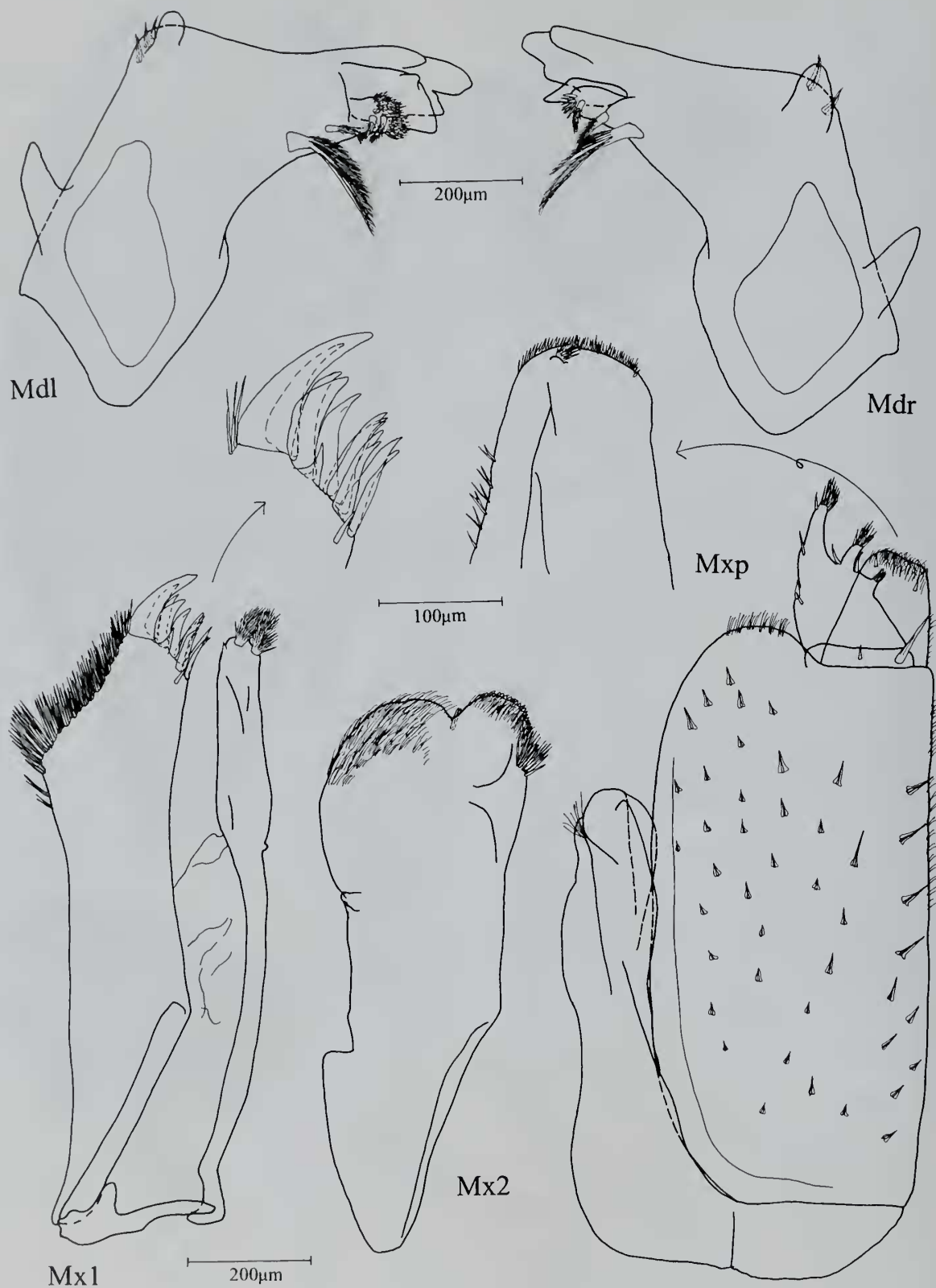


Fig. 2 *Ischioscia fasciifrons* sp. nov. Holotype, male, 10 mm. Mdl/r left and right mandible; Mx1 maxillula with detail of apex of lateral endite in rostral view; Mx2 maxilla in caudal view; Mxp maxilliped, with detail of endite in rostral view.

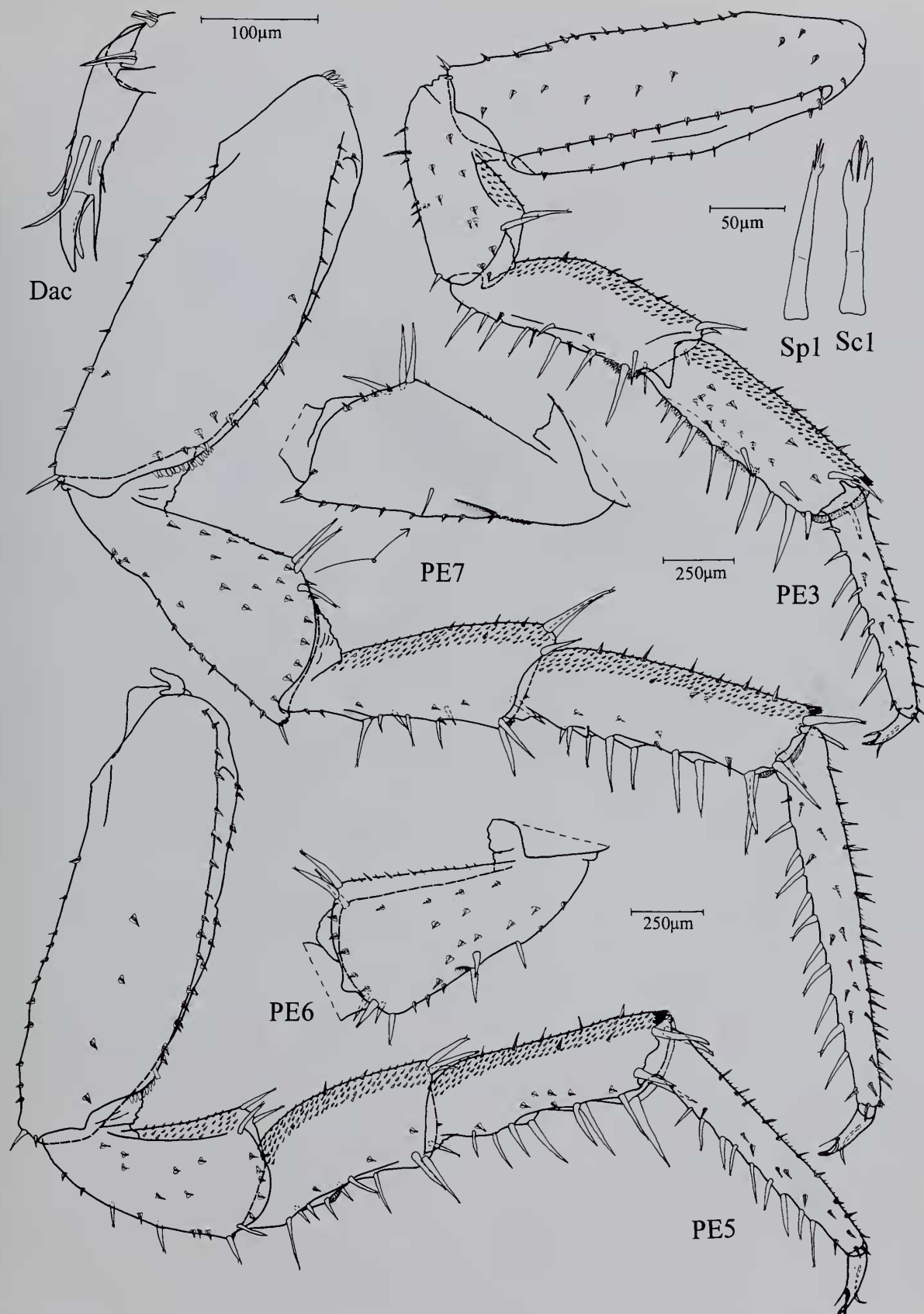


Fig. 3 *Ischioscia fasciifrons* sp. nov. Holotype, male, 10 mm. Dac dactylus 1 in rostral view; PE3–7 pereopods 3 to 7 in caudal view, ischium 7 in rostral view; Sc1 ornamental sensory spine of carpus 1, Sp1 distalmost sensory spine of propus 1.

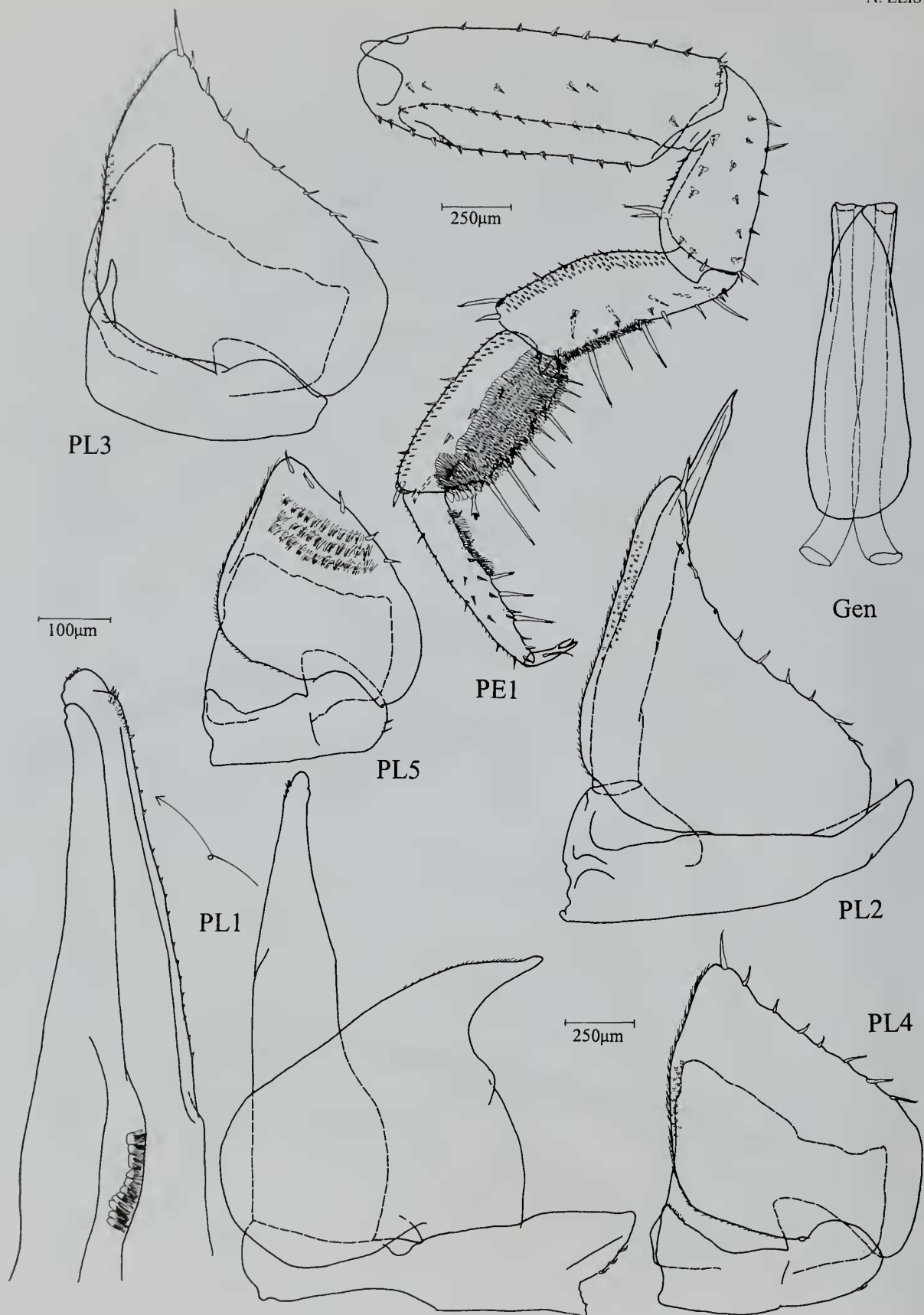


Fig. 4 *Ischioscia fasciifrons* sp. nov. Holotype, male, 10 mm. Gen genital papilla; PE1 pereopod 1 in rostral view; PL1–5 pleopods 1 to 5 in rostral view, with detail of endopodite 1 in caudal view.

Genital papilla. Ventral shield slightly surpassing terminal spatula (Fig. 4, Gen).

ETYMOLOGY. The species name refers to the conspicuously darker profrons, compared to the colouration of the cephalothorax.

***Ischioscia hirsuta* sp.nov.**

Figs 5–8

MATERIAL EXAMINED. Holotype, male (body length 11 mm): Andes, Mesa cerrada between La Puerta and Timotes, 9°00.26'N 70°44.20'W 1800 m \pm 200 m, on the bank of a brook under stones and moist leaf litter, sugar cane, shrub with climbing plants, Polygonaceae, Poaceae, leg. C. Schmidt 23.03.1998; Paratypes: 14 males, 10 females (with marsupium), 6 females, 2 immatures: same data as holotype; 6 males, 19 females (with marsupium), 15 females/immatures: Andes, road from Timotes to Mérida, 8°53.72'N 70°47.99'W 3400 m (\pm 500 m), very steep northern slope, covered with Bryophyta, Pteridophyta, Poaceae, Ericaceae, between Bryophyta, leg. C. Schmidt 23.03.1998 (MNHG); 3 males, 2 females (with marsupium), 10 females, 2 immatures: Andes, 8°43.12'N 70°46.04'W, on the bank of a brook near cattle meadow, scrub with Asteraceae, *Rubus*, one specimen submerged, leg. C. Schmidt 24.03.1998

DESCRIPTION

Colour. Ground colour chestnut with many light markings on cephalothorax and pereonites, coxal plates of same colour, dark brown band in the medial line of each pereonite, pleon bearing some light spots.

Cephalothorax. Linea frontalis lacking, lamina frontalis and linea supra-antennalis prominent. Vertex smooth with plenty flagelliform tricorn-like setae, laterally protruding compound eyes composed of 22 ommatidia in four rows (Fig. 5, Ctf).

Pereon. Tegument smooth and shiny, bearing many flagelliform tricorn-like setae, coxal plates I to IV caudally rounded, coxal plates V to VII increasingly pointed, sulcus marginalis present, no gland pores nor noduli laterales discernible in light microscope at 400x magnification (Fig. 5, Cx4).

Pleon. Set back from pereon despite neopleurae of pleonite 3 to 5. Pleotelson rather pointed, lateral margins concave, some tricorn-like setae near the apex.

Antennula. Similar to other species of genus (Fig. 5, An1).

Antenna. Flagellum three-articulate, with proximal article longest, somewhat shorter than peduncular article 5, apical organ longer than distal article, length ratio of peduncular articles similar to next species (Fig. 5, An2).

Mandible. Pars intermedia bearing coniform setae and two penicils on left, one on right side, additional plumose seta proximally, molar penicil consisting of about 7 branches (Fig. 6, Mdl/r).

Maxillula. Medial endite with two stout penicils apically and a short subapical tip, lateral endite with 4+6 teeth apically, 5 of inner set cleft, on caudal side, a hyaline lobe, stalk and two subapical teeth present (Fig. 6, Mx1).

Maxilla. Lateral lobe slightly broader than medial, bearing faint trichiae and pectinate scales, lateral area of rostral side seta-free, medial one densely covered with trichiae, medial setal tuft present, apically cuspidate (Fig. 6, Mx2).

Maxilliped. Basipodite with sulcus lateralis and many tricorn-like setae, palp with proximal setal tuft small, medial one stalked, as prominent as distal one, proximal article bearing a long and a very short seta, endite covered with trichiae, on rostral side with knob-like penicil (Fig. 6, Mxp).

Pereopods. Slender with many sensory spines on medial margin (Fig. 7, PE1–7), pereopod 1 carpus with antenna-grooming brush,

propus with antagonistic device, dactylus with long inner claw, dactylar seta apically plumose (Fig. 8, Dac). Sexual differentiation. Pereopods 1 to 3 with subequally enlarged carpus and setal field rostrally, merus 1 to 3 with medial setal field, propus 2 with small setal field. Pereopod 7 ischium with prominent setal brush on proximal half medially, very long trichiae inserted on the more rostral surface, distally connected with a small cuticular clasp, bordered by small depressions, caudally a row of small trichiae, medio-distally with a lobe covered with short trichiae, laterally two sensory spine, third spine more caudodistally, basis 7 medio-distally with setal field around distal sensory spine.

Pleopods. Pleopod endopodites slightly bilobate, exopodites with about 10 sensory spines laterally, pleopod 5 with creel of three rows of pectinate scales caudally, protopodites 3 to 5 with medial protrusion, protopodites 4 and 5 lacking rudimental epipodite (Fig. 8, PL1–5). Sexual differentiation. Male pleopod 1 exopodite triangular with rounded medial edge, lateral point small, incision proximally bordered by small protrusion, endopodite slender with lateral row of spines, apex with prominent tooth rostrally, faint trichiae caudally, medial protrusion subapically. Pleopod 2 exopodite as in other species, with minute pectinate scales medially, endopodite pointed.

Uropod. As in other members of the genus.

Genital papilla. Ventral shield slender, terminal spatule not surpassing ventral shield (Fig. 8, Gen).

ETYMOLOGY. The species is named for its long tricorn-like setae on the pereonites, giving it a hairy appearance.

***Ischioscia colorata* sp.nov.**

Figs 9–12

MATERIAL EXAMINED. Holotype, male (body length 14 mm): Aragua, Parque Nacional Henri Pittier, Road from Rancho Grande to the seaside, near Capilla Virgen del Carmen, mist forest, near brook and cascade in moist leaf litter and under stones, leg. C. Schmidt 14.03.1998. Paratypes, 10 females (with marsupium), 2 females, 2 immatures: same data as holotype; 6 males, several immature males, 8 females, 4 immatures: Parque Nacional El Ávila, 10°33.01' N 66°53.88' W, high in the mountains at 1700 m (\pm 200 m), within leaf litter near cliff, leg. C. Schmidt 10.03.1998.

DESCRIPTION

Colour. Pereonites chestnut with coxal plates slightly darker, many light spots of the muscle insertions and other light areas on coxal plates and neopleurae conspicuous, umber medial line, cephalothorax chestnut with light patches.

Cephalothorax. Like other Venezuelan species of this genus, linea frontalis reduced, linea supra-antennal conspicuous, slightly bent above antennal sockets, compound eyes large, comprising about 26 ommatidia, vertex bearing several long tricorn-like setae (Fig. 9, Ctf). **Pereon.** Tergites smooth and somewhat shiny, sparsely covered with tricorn-like setae, coxal plates fused without groove. Coxal plates 1–3 caudally rounded, 4–7 increasingly pointed. No noduli laterales visible in light microscope at 400x magnification (Fig. 9, Cx4).

Pleon. Set back from the pereon, neopleurae of pleonite 3–5 well-developed. Pleotelson pointed with latero-distal margins concave. Tip of telson tapered, bearing tricorn-like setae of various length.

Antennula. Three-articulate, first article strongest, with distal shield, distal article coniform, bearing at least 5 rows of aesthetascs (Fig. 9, An1).

Antenna. Flagellum composed of three articles, proximal article of half the length of flagellum, distal one shorter, bearing slightly longer apical organ. Peduncular articles 4 and 5 almost subequal,

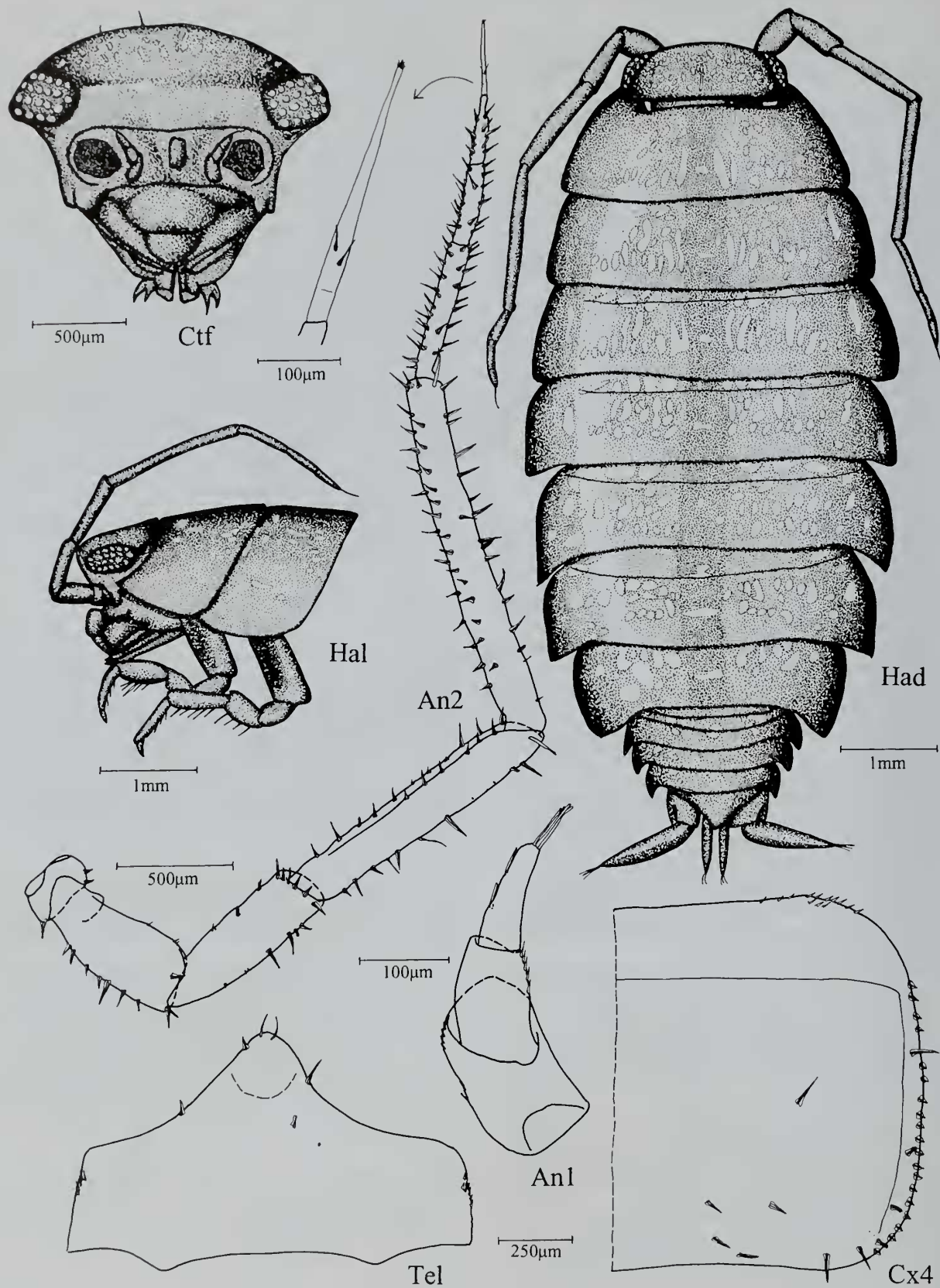


Fig. 5 *Ischioscia hirsuta* sp. nov. Holotype, male 11 mm. An1 antennula; An2 antenna with detail of apical organ; Ctf cephalothorax in frontal view; Cx4 coxal plate 4; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson.

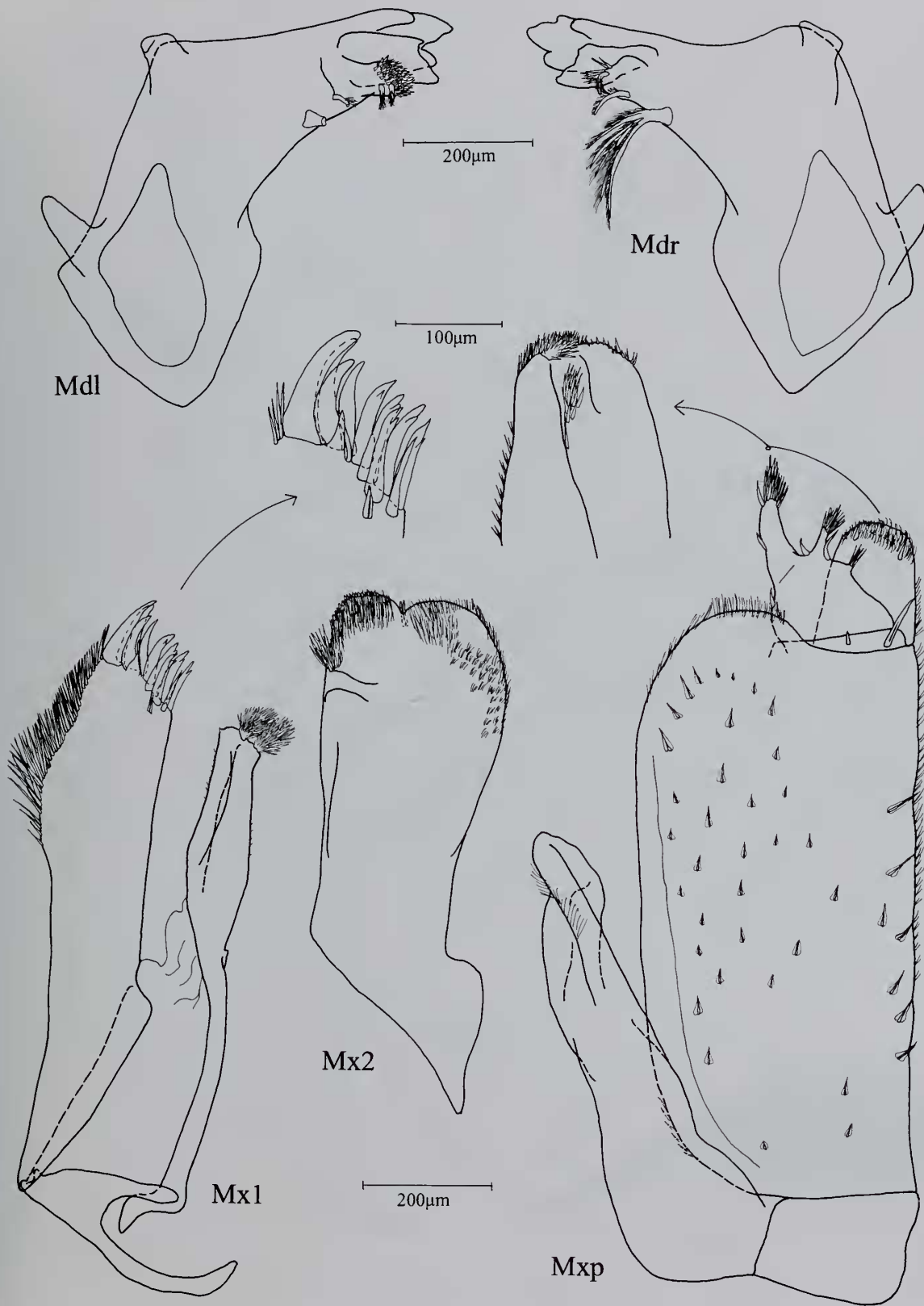


Fig. 6 *Ischioscia hirsuta* sp. nov. Holotype, male, 11 mm. Mdl/r left and right mandible; Mx1 maxillula with detail of apex of lateral endite in rostral view; Mx2 maxilla in rostral view; Mxp maxilliped, with detail of endite in rostral view.

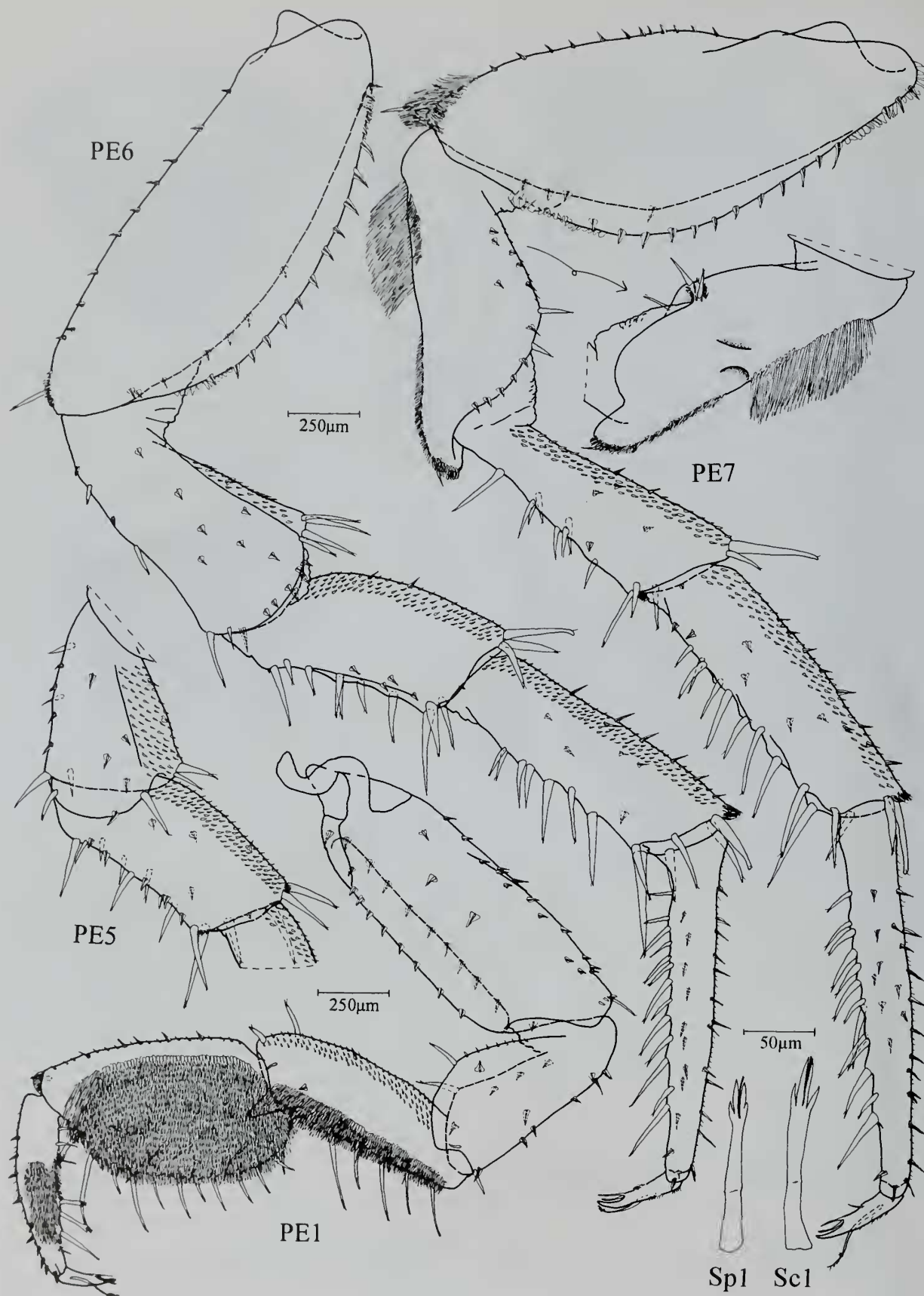


Fig. 7 *Ischioscia hirsuta* sp. nov. Holotype, male, 11 mm. PE1 pereopod 1 in rostral view; PE5 pereopod 5 merus and ischium in caudal view; PE6/7 pereopods 6 and 7 in caudal view, with ischium 7 in rostral view; Sc1 ornamental sensory spine of carpus 1, Sp1 distalmost sensory spine of propus 1.

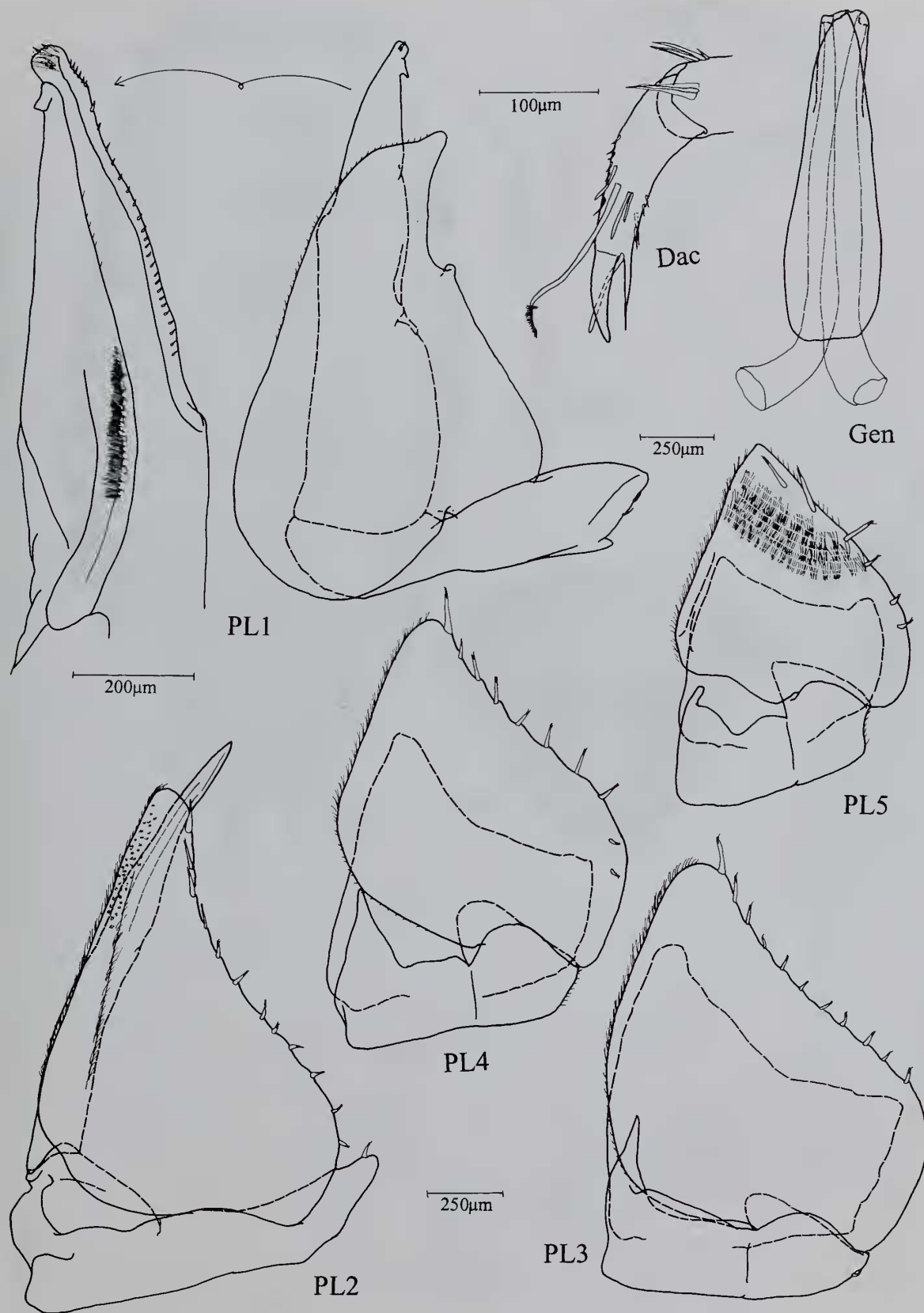


Fig. 8 *Ischioscia hirsuta* sp. nov. Holotype, male, 11 mm. Dac dactylus 1 in rostral view; Gen genital papilla; PL1–5 pleopods 1 to 5 in rostral view, with detail of endopodite 1 in caudal view.

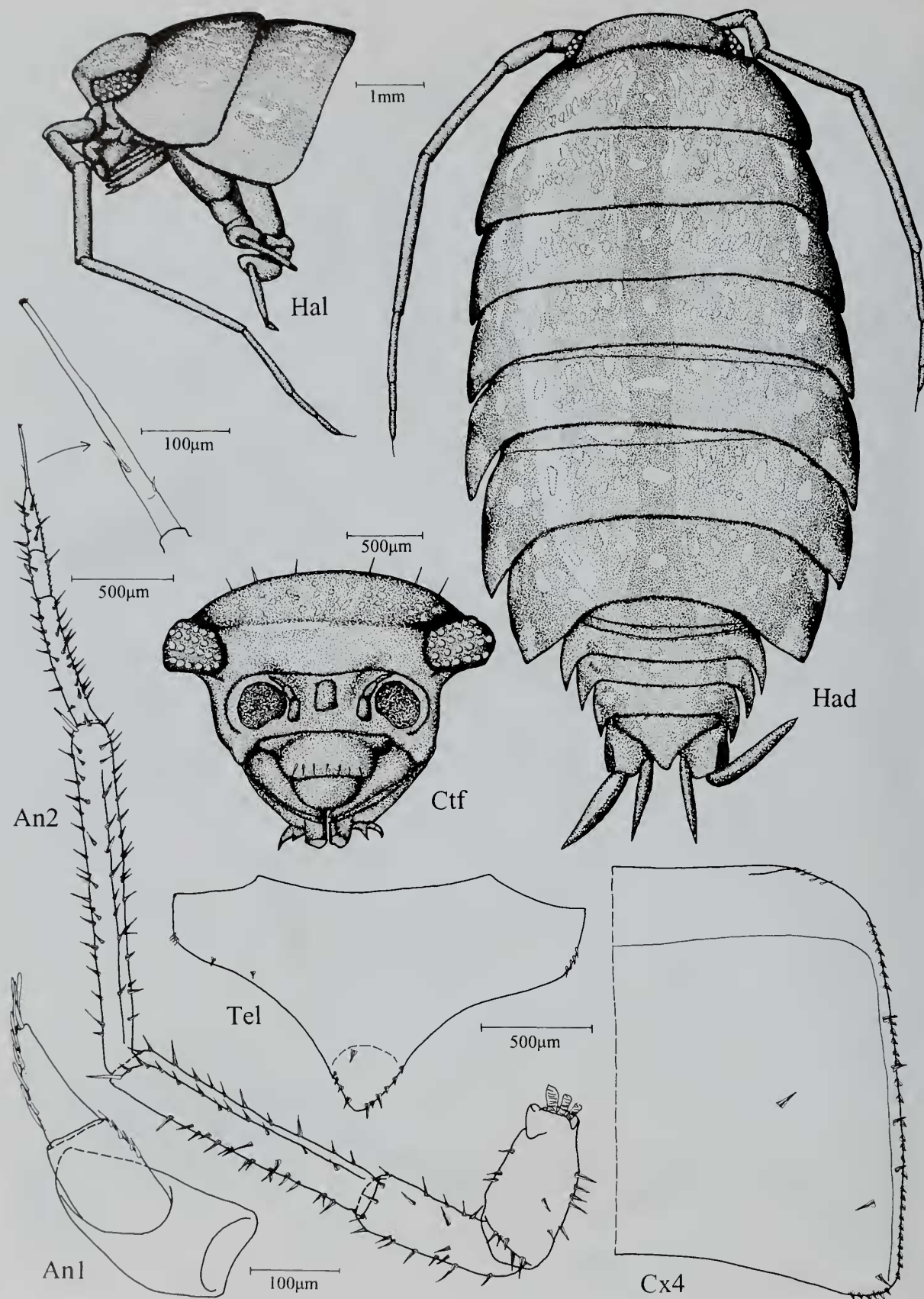


Fig. 9 *Ischioscia colorata* sp. nov. Holotype, male, 14 mm. An1 antennula; An2 antenna with detail of apical organ; Ctf cephalothorax in frontal view; Cx4 coxal plate 4; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson.

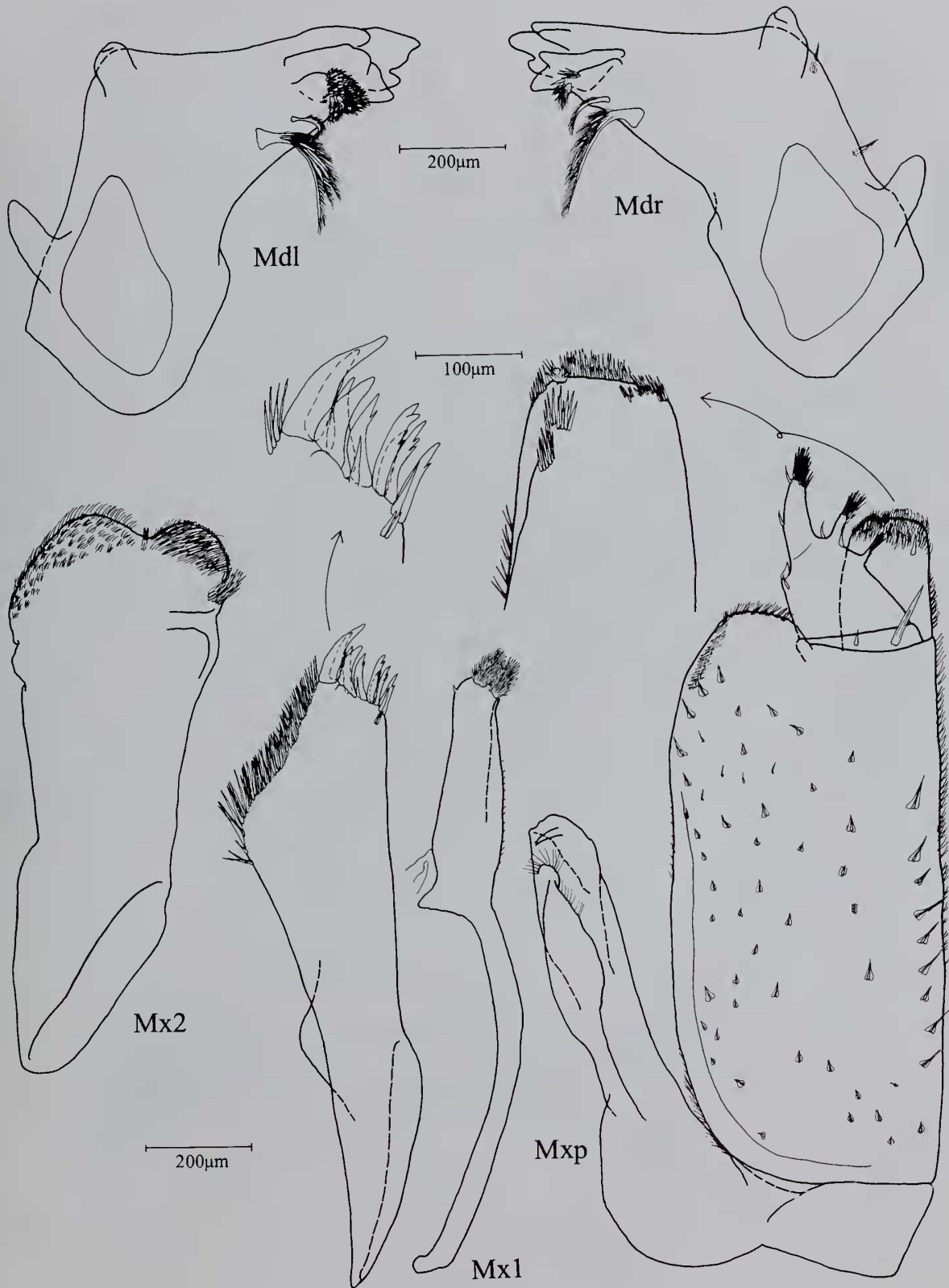


Fig. 10 *Ischioscia colorata* sp. nov. Holotype, male, 14 mm. Mdl/r left and right mandible; Mx1 maxillula with detail of apex of lateral endite in rostral view; Mx2 maxilla in rostral view; Mxp maxilliped, with detail of endite in rostral view.

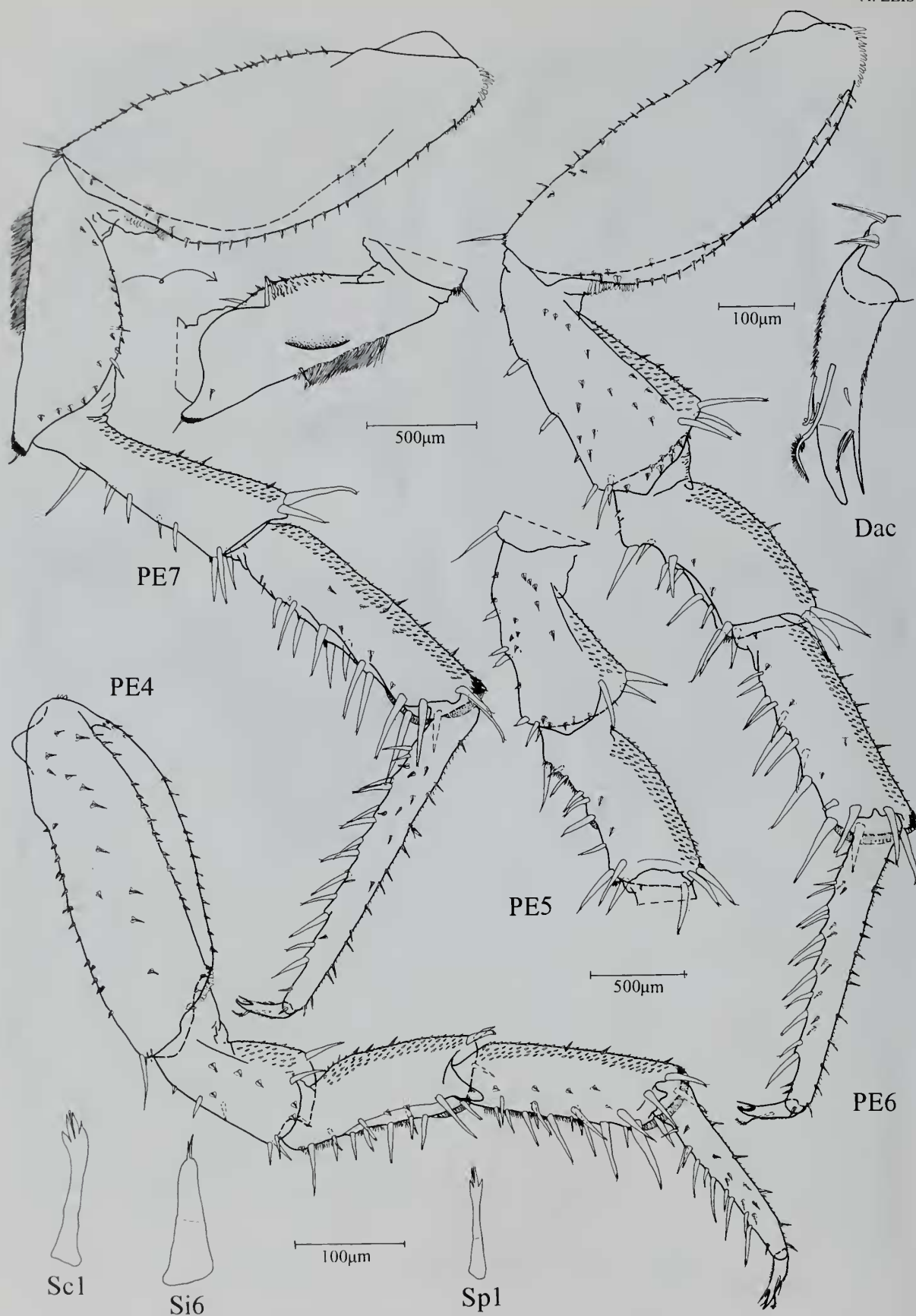


Fig. 11 *Ischioscia colorata* sp. nov. Holotype, male, 14 mm. Dac dactylus 1 in rostral view; PE4–7 pereopods 4 to 7 in caudal view, ischium 7 in rostral view; Sc1 ornamental sensory spine of carpus 1; Si6 sensory spine of ischium 6; Sp1 distalmost sensory spine of propus 1.

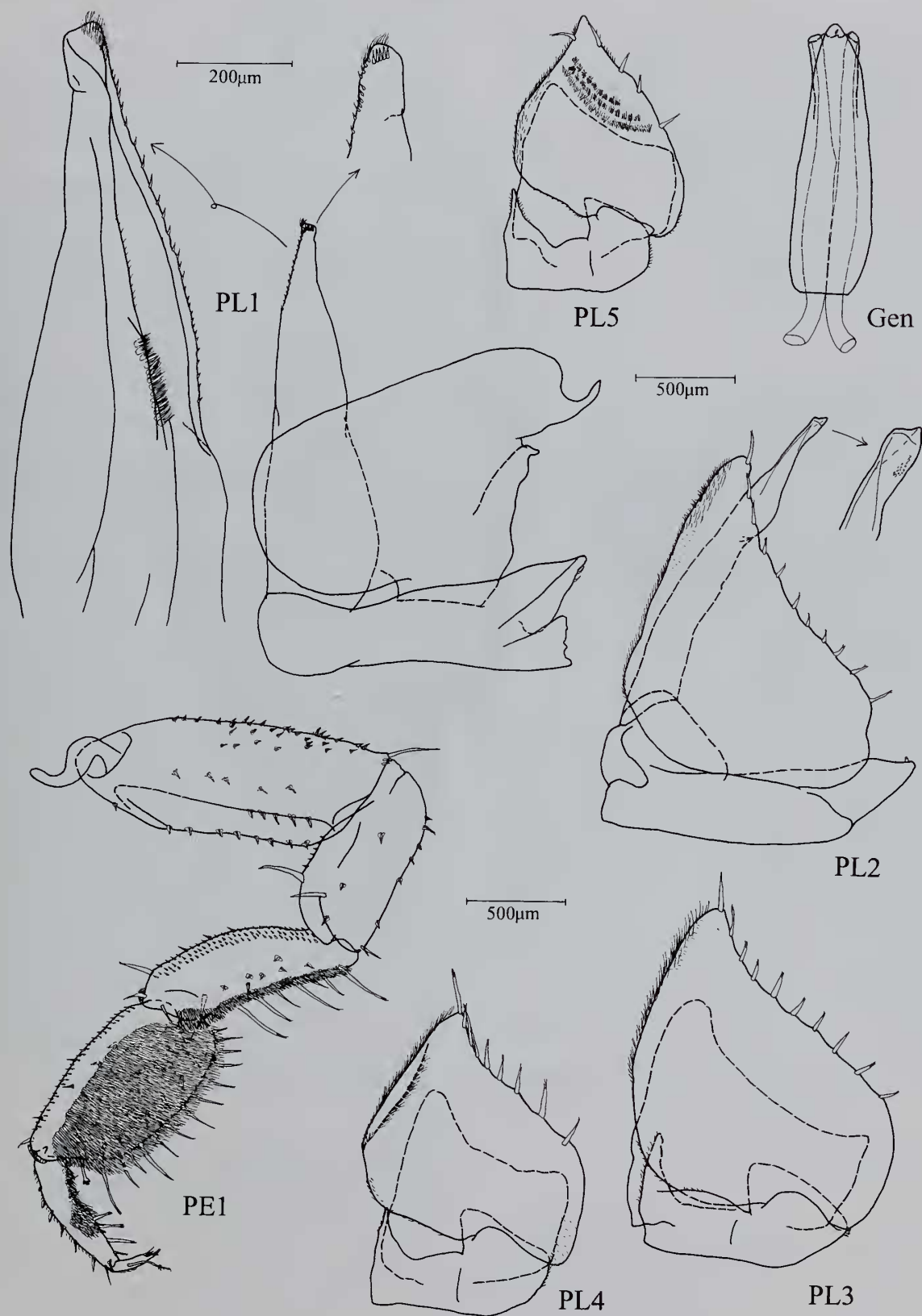


Fig. 12 *Ischioscia colorata* sp. nov. Holotype, male, 14 mm. Gen genital papilla; PE1 pereopod 1 in rostral view; PL1–5 pleopods 1 to 5 in rostral view, with detail of endopodite 1 in caudal view.

each as long as flagellum, articles 2 and 3 half the length, proximal article short, all covered with sensory spines and tricorn-like setae (Fig. 9, An2).

Mandible. Molar penicil with about 7 branches, pars intermedia with coniform setae, and two penicils on left, one on right side, additional plumose seta proximally (Fig. 10, Mdl/r).

Maxillula. Medial endite with two stout penicils and small subapical tip, lateral endite with 4+6 teeth apically, 5 of inner set cleft, one of those double-cleft, two subapical teeth caudally, hyaline lobe very slender (Fig. 10, Mx1).

Maxilla. Lateral endite broader than medial, covered with pectinate scales, medial lobe with denser setation, apex with about 15 cusps, setal tuft individualized (Fig. 10, Mx2).

Maxilliped. Basipodite with sulcus lateralis and many tricorn-like setae, palp with medial and proximal setal tuft stalked, proximal more indistinctly, proximal article with long and very short seta (Fig. 10, Mxp).

Pereopods. Slender, as in other species of the genus (Fig. 11, PE4–7; Fig. 12, PE1), dactylus with long inner claw and apically plumose dactylar seta (Fig. 11, Dac), antenna-grooming devices on propus and carpus 1 (Fig. 12, PE1). Sexual differentiation. All pereopods sexually differentiated: pereopod 1 to 3 with enlarged carpus bearing setal fields rostrally, enlargement gradually decreasing from 1 to 3, merus and propus with setal brushes, too. Pereopod 4 with scattered setae on medial margin of carpus and merus, pereopod 5 with setal field medio-proximally on merus, ischium with four stout sensory spines medially. Pereopod 6 merus with prominent hump medio-proximally, ischium with two stout sensory spines medially, pereopod 7 merus with long proximal sensory spine and four along medial margin, ischium as in other species in the *variegata*-group, i. e. a prominent medial brush, a distal lobe and a rostral depression.

Pleopods. Pleopod endopodites slightly bilobate, exopodites with about 10 sensory spines laterally, medially distinctly covered with trichiae, exopodite 5 with creel of three rows of pectinate scales, distal ones parallel, proximal one diverging, protopodite 3 to 5 with slightly setose medial protrusion, laterally no rudimental epipodites, only few trichiae (Fig. 12, PL1–5). Sexual differentiation. Male pleopod 1 exopodite obtuse triangular, lateral point recurved, incision with transverse folding proximally on caudal side, endopodite straight, apex obtuse, rostrally with 5 to 6 teeth, caudally with tuft of hyaline trichiae, lateral row of spines present. Pleopod 2 exopodite elongate with sinuous lateral margin bearing 11 sensory spines, medially with trichiae, endopodite with truncate apex, bearing some faint granules caudally.

Uropod. Exopodite and endopodite subequal in length.

Genital papilla. Ventral shield slightly surpassing terminal spatula (Fig. 12, Gen).

ETYMOLOGY. The specific name refers to the colourful dorsal tegument.

Ischioscia pariae sp. nov.

Figs 13–16

MATERIAL EXAMINED. Holotype, male (body length 10 mm): Península de Paria, El Refugio de la Cerbatana, primary forest with high trees covered with Bryophyta, Bromeliaceae, Lycopodiaceae, vines, very humid, in leaf litter, leg. C. Schmidt 04.04.1998. Paratypes: 4 males, 6 females, 7 immatures: same data as holotype; 7 males, 7 females (with marsupium), 8 females: Península de Paria, El Rincón, 10°35.94' N 63°11.81' W, small brook, water only in upper half, humid forest, lower part in coacoa

plantation, with some very high Bombacaceae, near small well, leg. C. Schmidt 09.04.1998.

DESCRIPTION

Colour. Basic colour chestnut, prominent light patches on medial line of tergites and coxal plates, between them smaller irregular patches, caudal patches on median line dark umber, pleon chestnut with white patches in medial line, cephalothorax covered with small white spots, representing muscle insertions.

Cephalothorax. Linea supra-antennalis prominent, linea frontalis lacking, with lamina frontalis, vertex flat, covered with some setae, compound eyes consisting of 25 ommatidia in 4 rows (Fig. 13, Ctf). **Pereon.** Tegument rather smooth and shiny, coxal plates 1 to 3 rounded, coxal plates 4 to 7 caudally pointed, no noduli laterales nor gland pores discernible, sulcus marginalis present.

Pleon. Retracted from pereon, pleonites 3 to 5 with small neopleurae, pleotelson with concave margins, densely covered with small cuticle-covered sensilla.

Antennula. As in other species of genus, differing in position of aesthetascs on distal article, which are inserted at almost entire medial margin (Fig. 13, An1).

Antenna. Peduncle rather long with typical length ratio of other members of the genus, flagellum with proximal article longest, of half length of flagellum, apical organ longer than medial article (Fig. 13, An2).

Mandible. Molar penicil composed of about 7 branches, additional plumose seta long, pars intermedia with two penicils on left and one on right mandible, coniform setae on both sides (Fig. 14, Mdl/r).

Maxillula. Medial endite with two stout penicils and small subapical tip, lateral endite bearing 4+6 teeth apically, five of inner set cleft, on caudal side with hyaline lobe, stalk and two slender subapical teeth, laterally fringed with trichiae (Fig. 14, Mx1).

Maxilla. Lateral lobe slightly broader than medial one, covered with pectinate scales and faint trichiae, medial lobe densely covered with trichiae, apically with about 15 cusps (Fig. 14, Mx2).

Maxilliped. Basipodite with sulcus lateralis, palp with one seta on proximal article, medial article with two setal tufts, distal one stalked, distal article with prominent setal tuft, endite caudally setose with two teeth, rostrally with prominent penicil (Fig. 14, Mxp).

Pereopods. Pereopod 1 carpus and propus with antenna-grooming brushes (Fig. 15, PE2–7; Fig. 16, PE1), dactylus with a hyaline cuticular scale laterally of main claw, inner claw long, dactylar seta with an enlarged apex, subapically some plumules (Fig. 15, Dac). Sexual differentiation. Male pereopods 1 to 3 with enlarged carpus and prominent setal fields rostrally, carpus 2 and 3 only slightly enlarged, merus 1 to 3 with medial setal field, setal field present on propus 2, too. Pereopod 7 ischium with distal lobe, sparsely covered with trichiae, setal brush on medio-proximal half slightly directed rostrally, more laterally accompanied by a prominent groove extending to the lateral margin, two sensory spines on lateral margin.

Pleopods. Endopodites more rectangular and exopodites more triangular as in preceding species, especially in pleopod 5, laterally bearing 6 to 8 sensory spines, protopodite 3 to 5 lacking rudimental epipodites (Fig. 16, PL1–5). Sexual differentiation. Pleopod exopodite triangular with rounded medial edge and slightly sinuous medial margin, almost continued by lateral protrusion, incision proximally bordered by a step-like additional tip, endopodite straight, apically pointed with small lateral protrusion subapically, caudolateral row of minute spines, single prominent spine apically. Pleopod 2 with only slightly sinuous lateral margin bearing 8 sensory spines, endopodite with apex shaped like a hypodermal needle.

Uropod. Exopodites rather long (Fig. 13, UR).

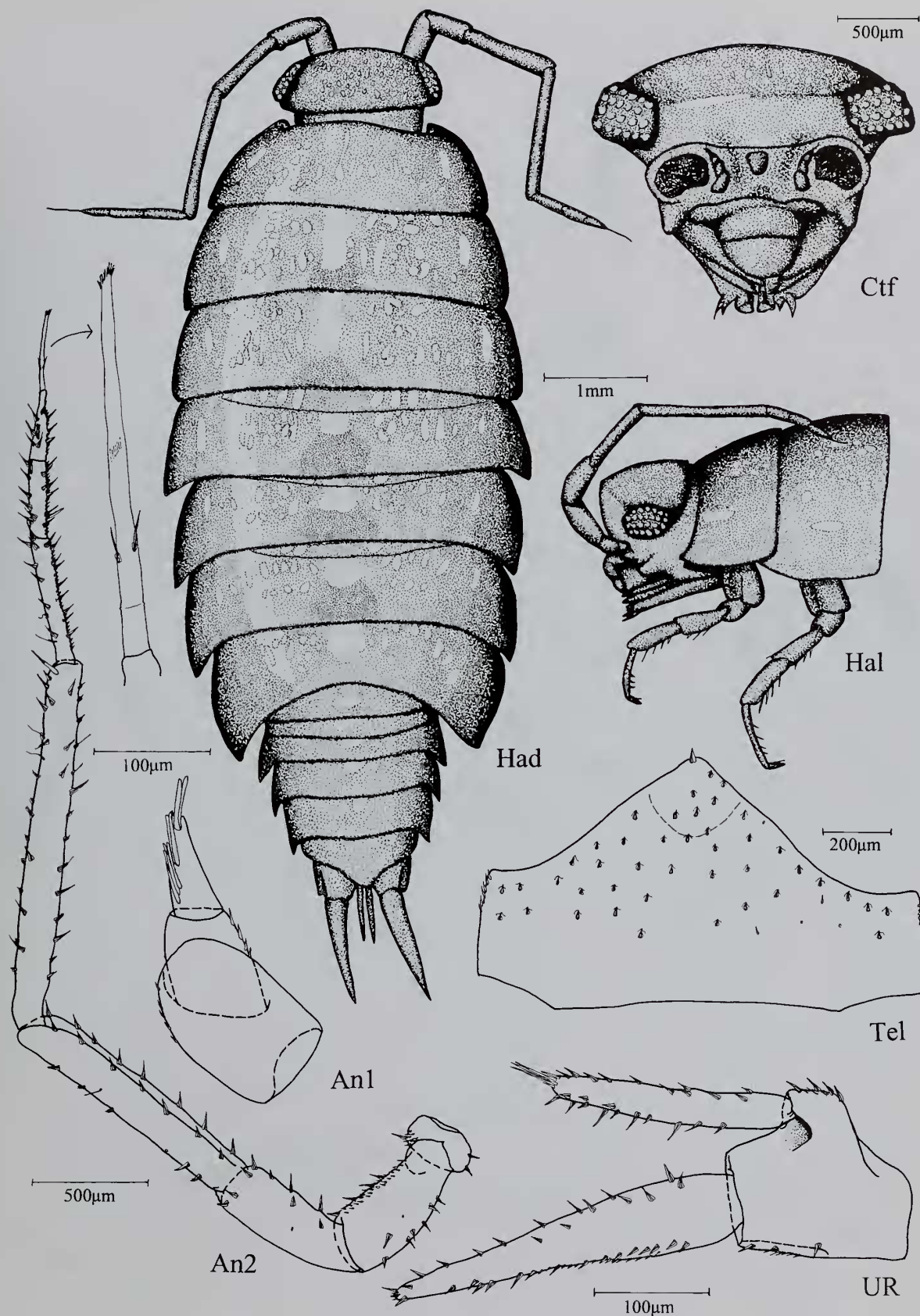


Fig. 13 *Ischioscia pariae* sp. nov. Holotype, 13 mm. An1 antennula; An2 antenna with detail of apical organ; Ctf cephalothorax in frontal view; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson; UR uropod in rostral view.

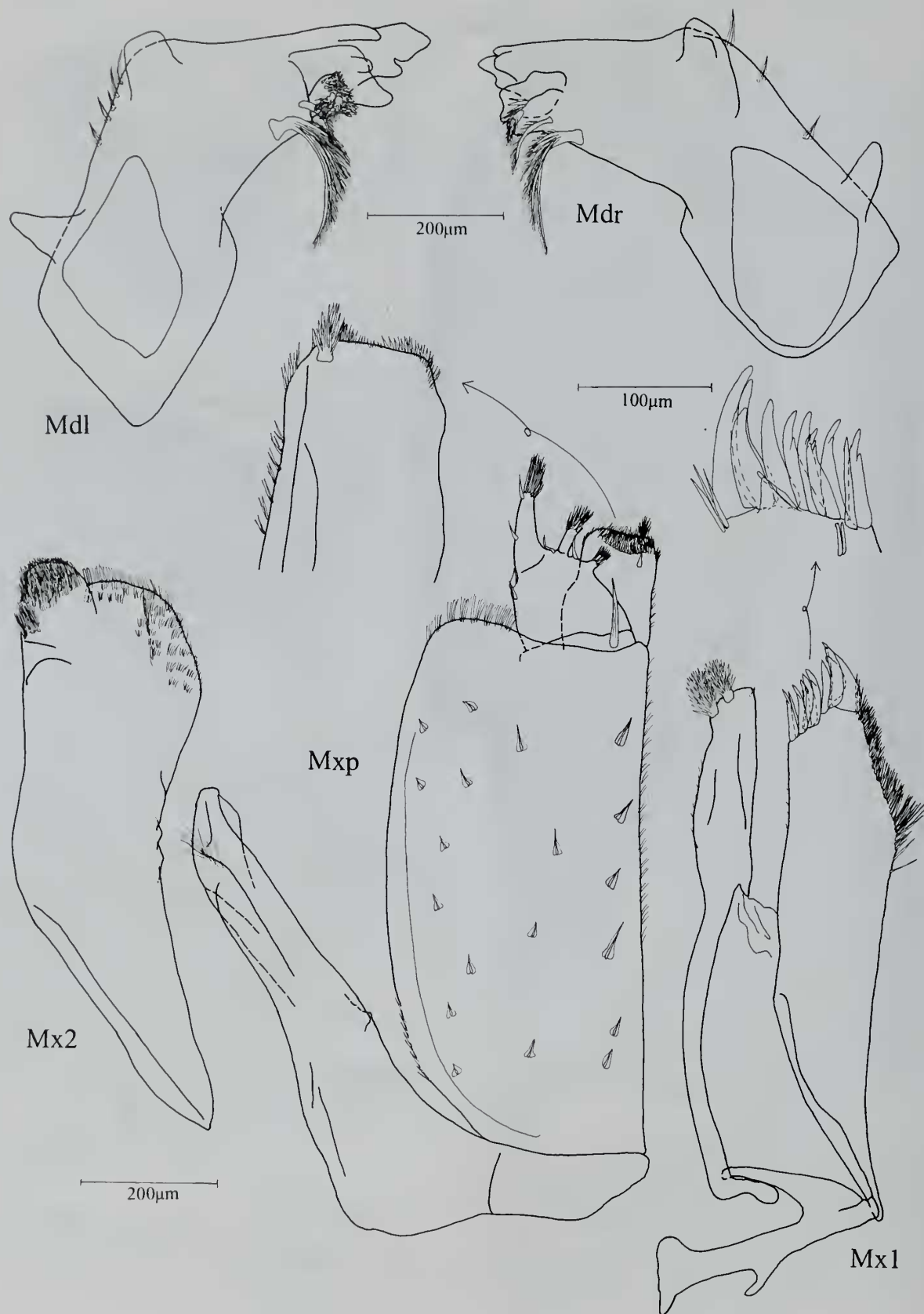


Fig. 14 *Ischioscia pariae* sp. nov. Holotype, 13 mm. Mdl/r left and right mandible; Mx1 maxillula in caudal view, with detail of apex of lateral endite in rostral view; Mx2 maxilla in rostral view; Mxp maxilliped, with detail of endite in rostral view.

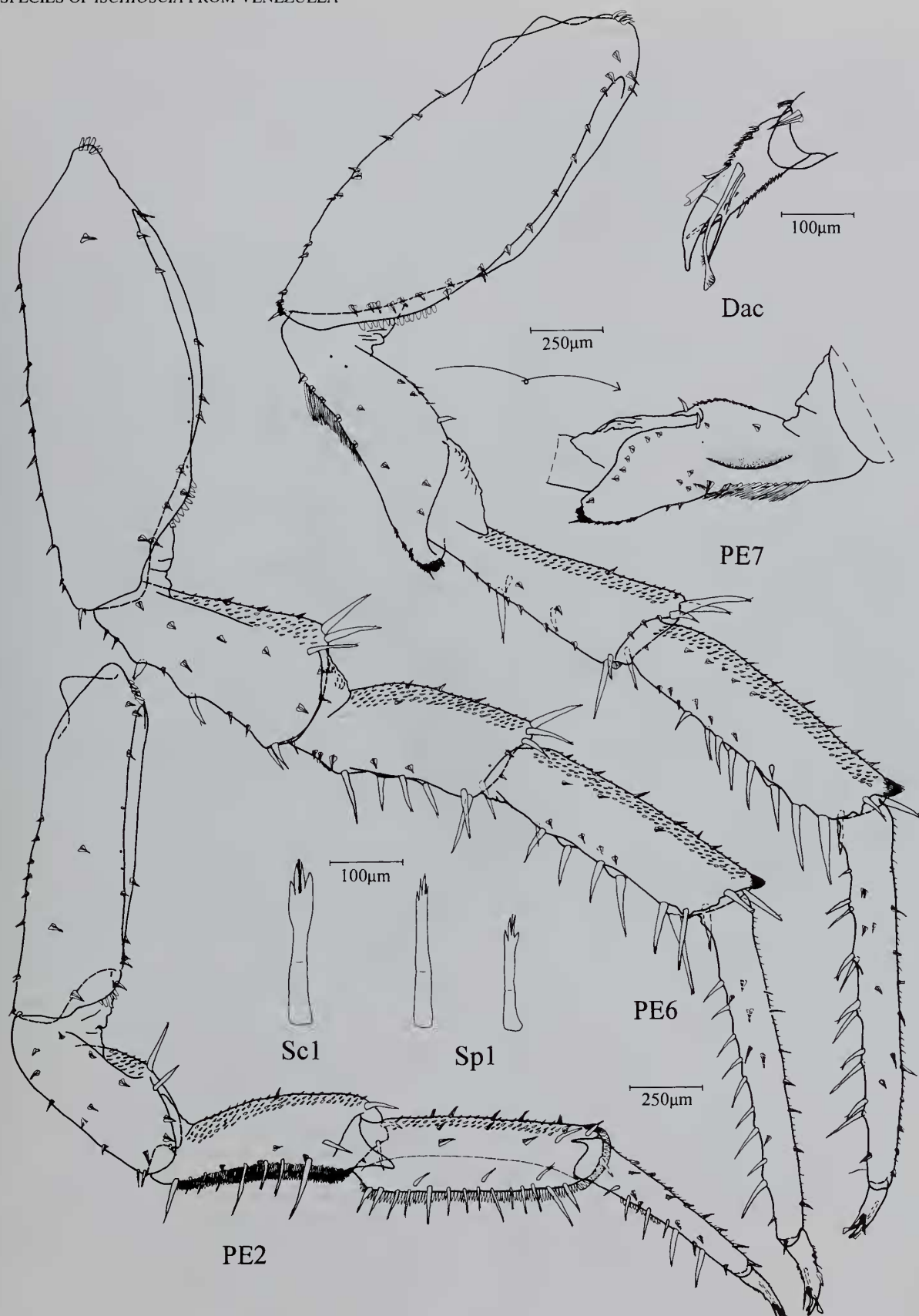


Fig. 15 *Ischioscia pariae* sp. nov. Holotype, 13 mm. Dac dactylus 1 in rostral view; PE2–7 pereopods 2, 6, 7 in caudal view, ischium 7 in rostral view; Sc1 ornamental sensory spine and proximal sensory spine of carpus 1; Sp1 distalmost sensory spine of propus 1.

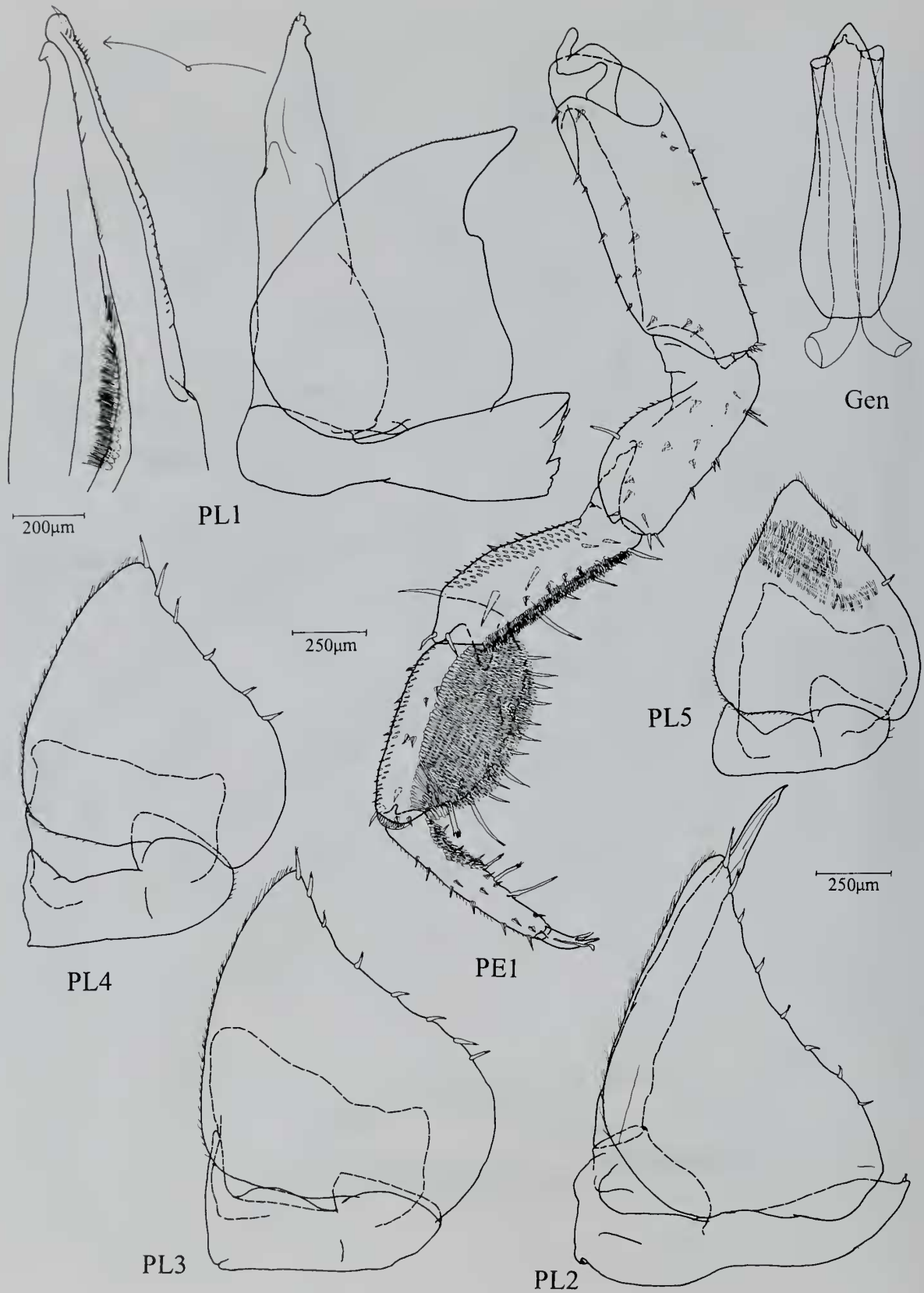


Fig. 16 *Ischioscia pariae* sp. nov. Holotype, 13 mm. Gen genital papilla; PE1 pereopod 1 in rostral view; PL1–5 pleopods 1 to 5 in rostral view, with detail of endopodite 1 in caudal view.

Genital papilla. Ventral shield distinctly surpassing terminal spatula (Fig. 16, Gen).

ECOLOGICAL NOTE. This species is capable of jumping about 5 cm.

ETYMOLOGY. The species name refers to the distribution on Península de Paria.

Ischioscia guamae sp.nov.

Figs 17–20

MATERIAL EXAMINED. Holotype, male (body length 13 mm); Rio La Guama, 9°46.48' N 68°24.6' W, river valley between dry mountains, in leaf litter, leg. C. Schmidt 25.03.1998. Paratypes 1 males, 3 females 11 immatures: same data as holotype.

DESCRIPTION

Colour. Ground colour chestnut with several light markings on cephalothorax and pereonites, coxal plates with light margins, in coxal plates V to VII, two light patches instead of contiguous band, dark chestnut spot in the mid line of pereonite I to IV caudally, pleon bearing several pale spots.

Cephalothorax. Linea frontalis lacking, lamina frontalis and linea supra-antennalis prominent. Vertex smooth and free of setation, laterally protruding compound eyes composed of 22 ommatidia in four rows (Fig. 17, Ctf).

Pereon. Tegument smooth and shiny, bearing scattered setae, coxal plates 1 to 4 caudally rounded, coxal plates 5 to 7 increasingly pointed, sulcus marginalis present, no gland pores nor noduli laterales discernible in light microscope at 400x magnification (Fig. 17, Cx3).

Pleon. Set back from pereon despite neopleurae of pleonite 3 to 5. Pleotelson rather pointed, lateral margins concave, some tricorn-like setae apically.

Antennula. Similar to other species of genus (Fig. 17, An1).

Antenna. Rather short, flagellum three-articulate, with proximal article longest, somewhat shorter than peduncular article 5, tricorn-like setae on all articles, apical organ half as long as flagellum (Fig. 17, An2).

Mandible. Pars intermedia with two penicils on left and one on right side, several coniform setae, molar penicil composed of about 7 branches, additional plumose seta prominent (Fig. 18, Mdl/r).

Maxillula. Medial endite with two stout penicils and very small subapical tip, lateral endite apically with 4+6 teeth, 4 of inner set cleft, 2 very slender, caudally with hyaline lobe and slender subapical tooth (Fig. 18, Mx1).

Maxilla. Lateral lobe broader than medial lobe, covered with faint trichiae and pectinate scales, medial lobe densely setose, apically with about 15 cusps (Fig. 18, Mx2).

Maxilliped. Palp with three setal tufts medially, distal two very prominent, proximal article bearing long and short seta, endite with knob-like penicil on rostral side, caudally setose with two teeth, basipodite with sulcus lateralis (Fig. 18, Mxp).

Pereopods. Slender (Fig. 19, PE1–7), with dactylus bearing plumose dactylar seta and long inner claw (Fig. 19, Dac), pereopod 1 carpus with antenna-grooming brush and ornamental sensory spine with hand-like apex (Fig. 19, Sc1), propus 2 with antenna-grooming comb. Sexual differentiation. Pereopod 1 to 3 and 7 differentiated, propus 1 and 2, carpus and merus 1 to 3 with setal brush, carpus medially enlarged, conspicuously in pereopods 1 to 2, slightly in pereopod 3. Pereopod 7 ischium with setose medio-distal lobe, setal brush subproximally to half length, no rostral depression, merus 7 of characteristic shape, 2 medio-caudal sensory spines on proximal half.

Pleopods. Similar to other species of the genus, exopodites laterally with sensory spines, medially with minute pectinate scales, no

rudimental epipodites on protopodites 3 to 5 (Fig. 20, PL1–5). Sexual differentiation. Male pleopod 1 exopodite triangular with lateral incision bordered by lateral point and proximal protrusion, endopodite with wrinkled apex and subapical lateral protrusion, caudal row of spines reduced, some spines on apex, two of them very prominent, surpassing apex. Pleopod 2 endopodite slightly sinuous laterally, bearing about 7 sensory spines, endopodite slightly surpassing exopodite, apex pointed.

Uropod. As in other species of the genus.

Genital papilla. Ventral shield slightly surpassing terminal spatula (Fig. 20, Gen).

ETYMOLOGY. The species name is derived from Rio La Guama, the type locality.

Ischioscia trifasciata sp.nov.

Figs 21–24

MATERIAL EXAMINED. Holotype, male (body length 13 mm), Rancho Grande, 10°21' N 67°41' W, in ground traps 30 cm diameter, leg. O. Hernández 1995. Paratypes: several males and females: same data as holotype.

DESCRIPTION

Colour. Dorsal tegument rich chestnut with many yellowish patches, medial line and coxal plates dark umber brown, forming three bands, margin of coxal plates lighter, pleon chestnut with pairs of light spots on each pleonite, cephalothorax chestnut, vertex heavily spotted yellowish.

Cephalothorax. As in other species of *Ischioscia* with large, laterally protruding compound eyes composed of about 24 ommatidia, vertex somewhat flattened, linea frontalis lacking, linea supra-antennalis conspicuous, only slightly sinuous, between antennal sockets with prominent lamina frontalis (Fig. 21, Ctf).

Pereon. Coxal plates of pereonite 1–3 with rounded margins, fourth to seventh coxal plate increasingly caudally pointed, no noduli laterales. Tegument smooth with only few tricorn-like setae (Fig. 21, Cx4).

Pleon. Retracted from pereon, pleonites 3–5 with small neopleurae. Pleotelson with concave latero-distal margins, as long as protopodites of uropods, tricorn-like setae gathered at apex.

Antennula. Apex of three-articulate antennula coniform, terminated by tuft of three aesthetascs, row of at least four aesthetascs on medial border. Some hairlike setae on median article (Fig. 21, An1).

Antenna. Peduncular articles with various sensory and tricorn-like setae as dense as on flagellum. Fifth article the longest, fourth 3/4 the length of fifth, as long as third and second together, those subequal. Flagellar articles subsequently shorter, together longer than fourth peduncular article, apical organ of same length as distal flagellar article (Fig. 21, An2).

Mandible. Pars intermedia with two stout penicils on left, one on right mandible, proximally additional penicil, molar penicil composed of 6 to 7 branches (Fig. 22, Mdl/r).

Maxillula. Medial endite with 2 stout penicils apically, small apical tip, lateral endite laterally fringed with trichiae, apically bearing 4+6 teeth, 5 of inner set cleft, caudally with hyaline lobe, stalk and two small teeth with fringed apex (Fig. 22, Mx1).

Maxilla. Both lobes subequal in breadth, densely covered with faint trichiae, medial lobe apically with about 12 cusps (Fig. 22, Mx2).

Maxilliped. Basipodite with sulcus lateralis, endite with tooth and dense setation caudally, rostrally with conspicuous knob-like penicil, palp with proximal article bearing two unequal setae, distal articles fused without a groove, three setal tufts of 7 to about 25 setae, proximal and medial stalked (Fig. 22, Mxp).

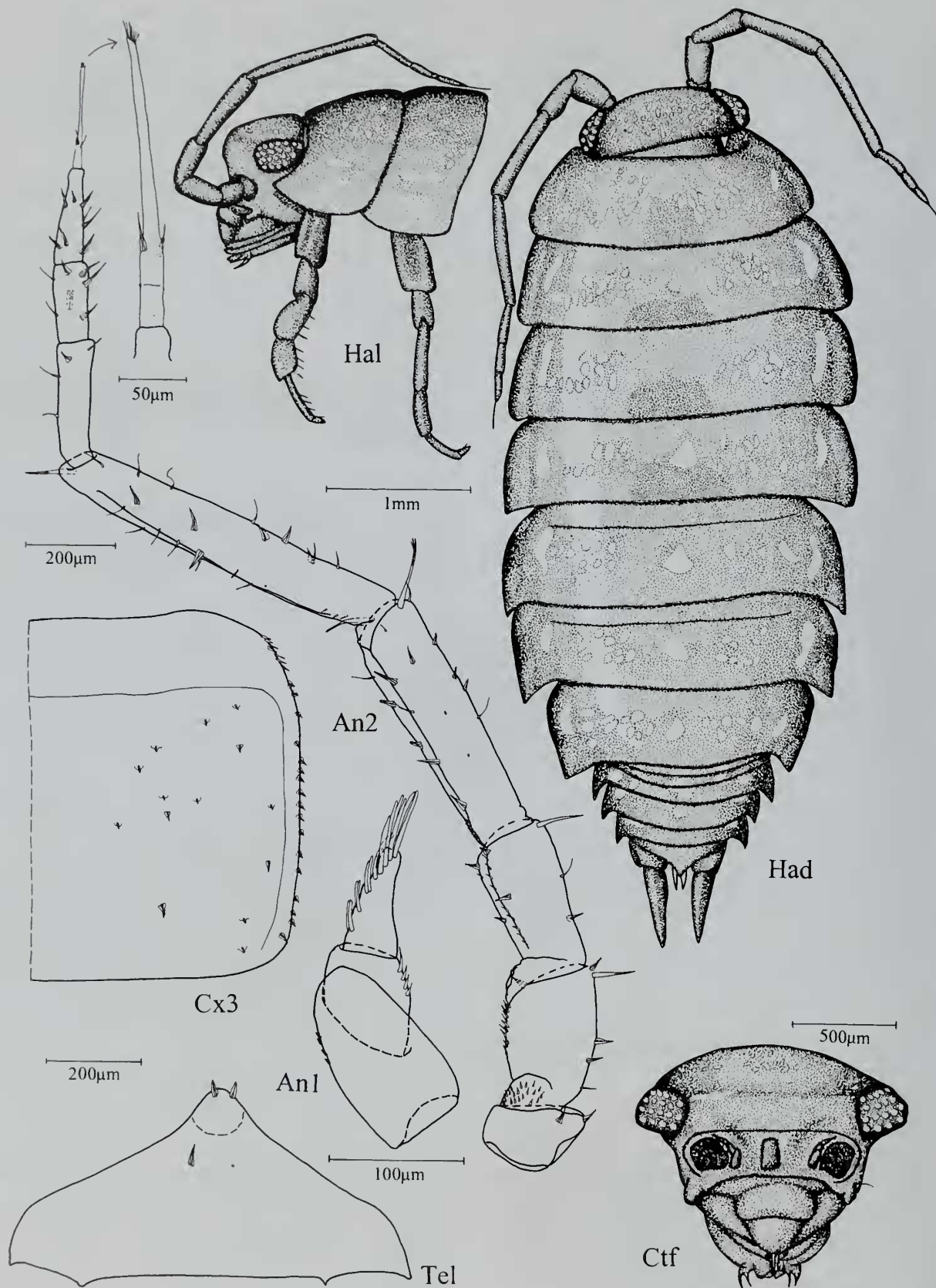


Fig. 17 *Ischioscia guamae* sp. nov. Holotype, male 13 mm. An1 antennula; An2 antenna with detail of apical organ; Ctf cephalothorax in frontal view; Cx3 coxal plate 3; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson.

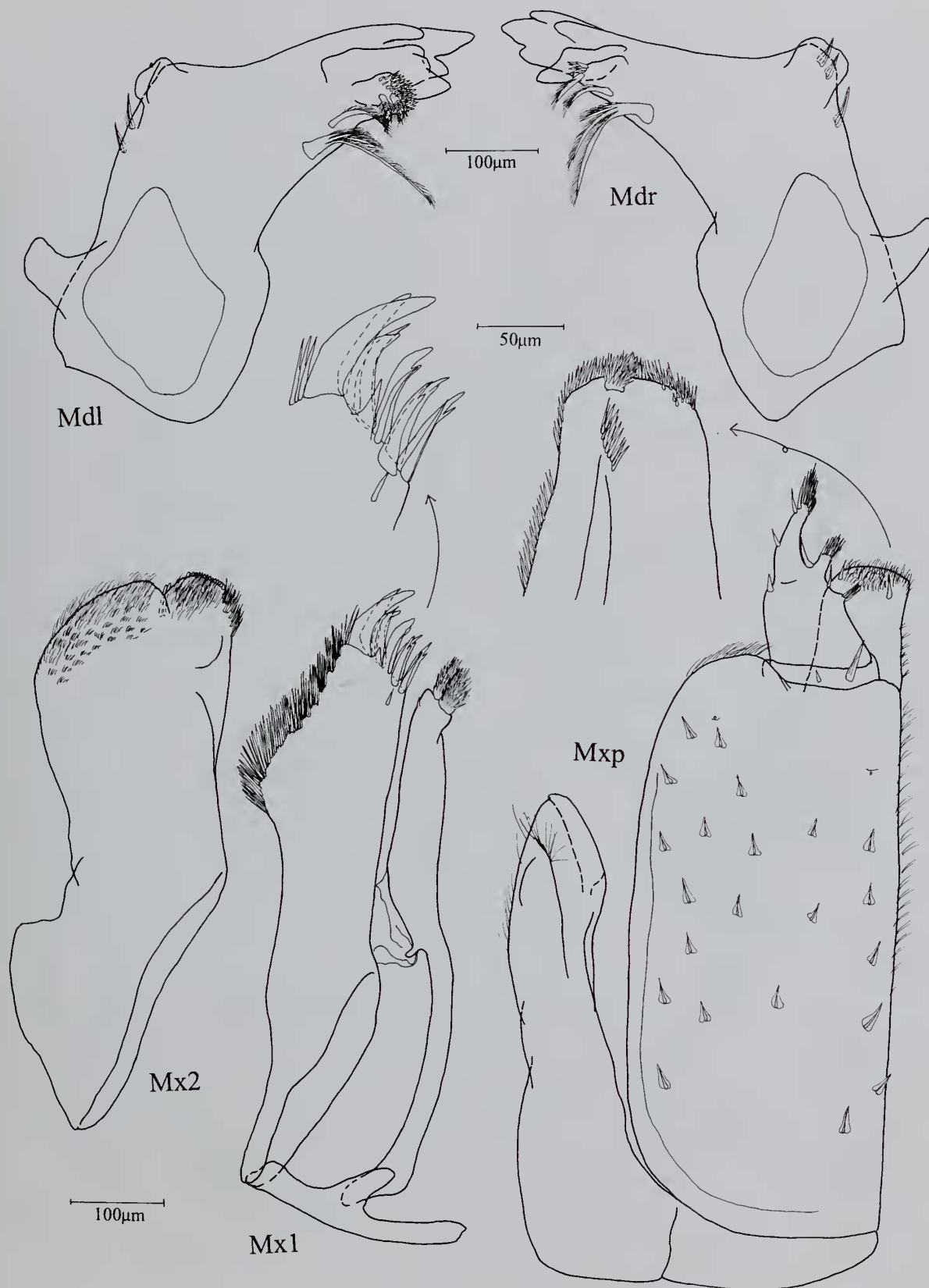


Fig. 18 *Ischioscia guamae* sp.nov. Holotype, male 13 mm. Mdl/r left and right mandible; Mx1 maxillula with detail of apex of lateral endite in rostral view; Mx2 maxilla in rostral view; Mxp maxilliped, with detail of endite in rostral view.

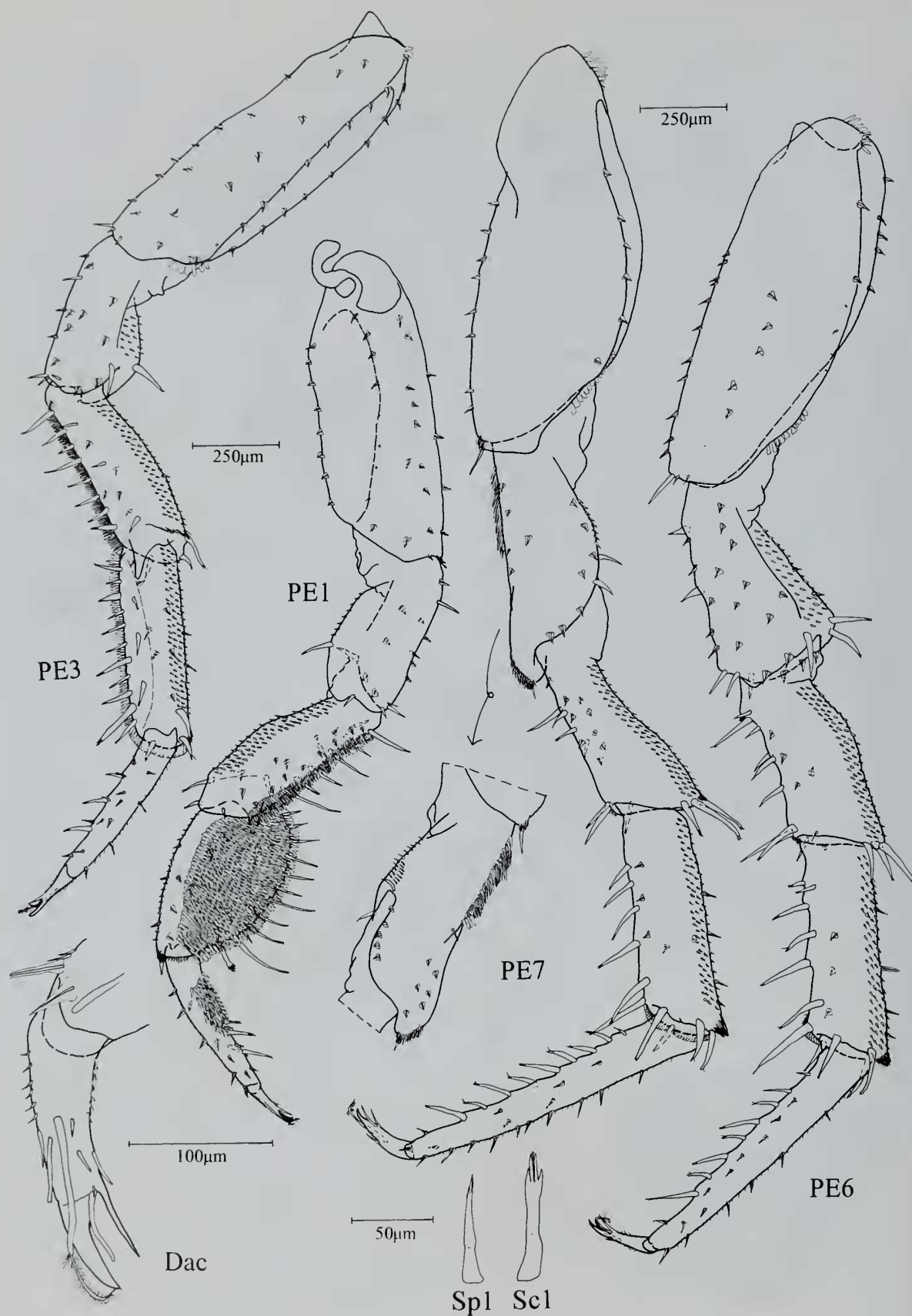


Fig. 19 *Ischioscia guamae* sp. nov. Holotype, male 13 mm. Dac dactylus 1 in rostral view; PE1 pereopod 1 in rostral view; PE3–7 pereopods 3, 6, 7 in caudal view, ischium 7 in rostral view; Sc1 ornamental sensory spine of carpus 1; Sp1 distalmost sensory spine of propus 1.

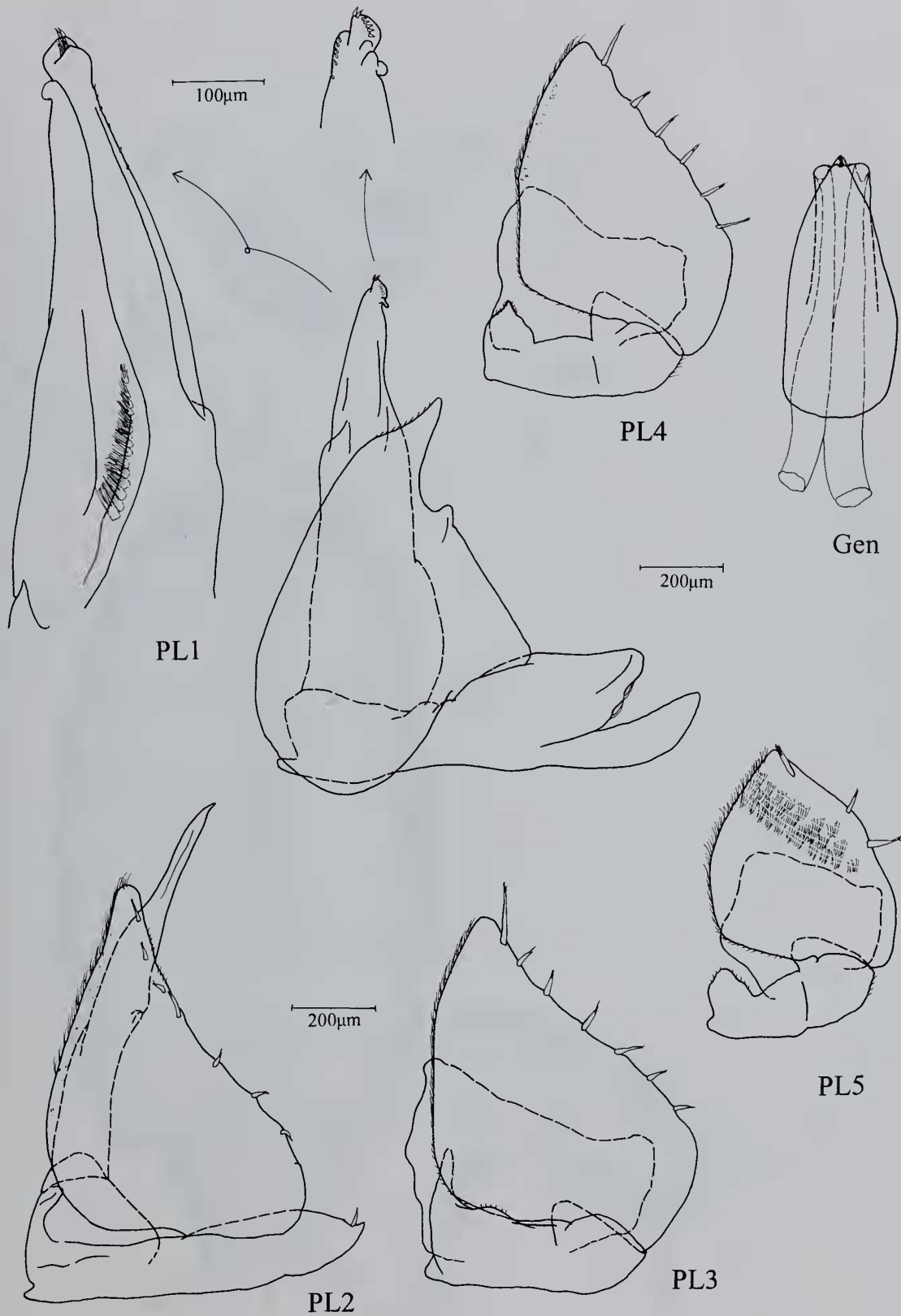


Fig. 20 *Ischioscia guamae* sp.nov. Holotype, male 13 mm. Gen genital papilla; PL1–5 pleopods 1 to 5, rostral view, with detail of endopodite 1 in rostral and caudal view.

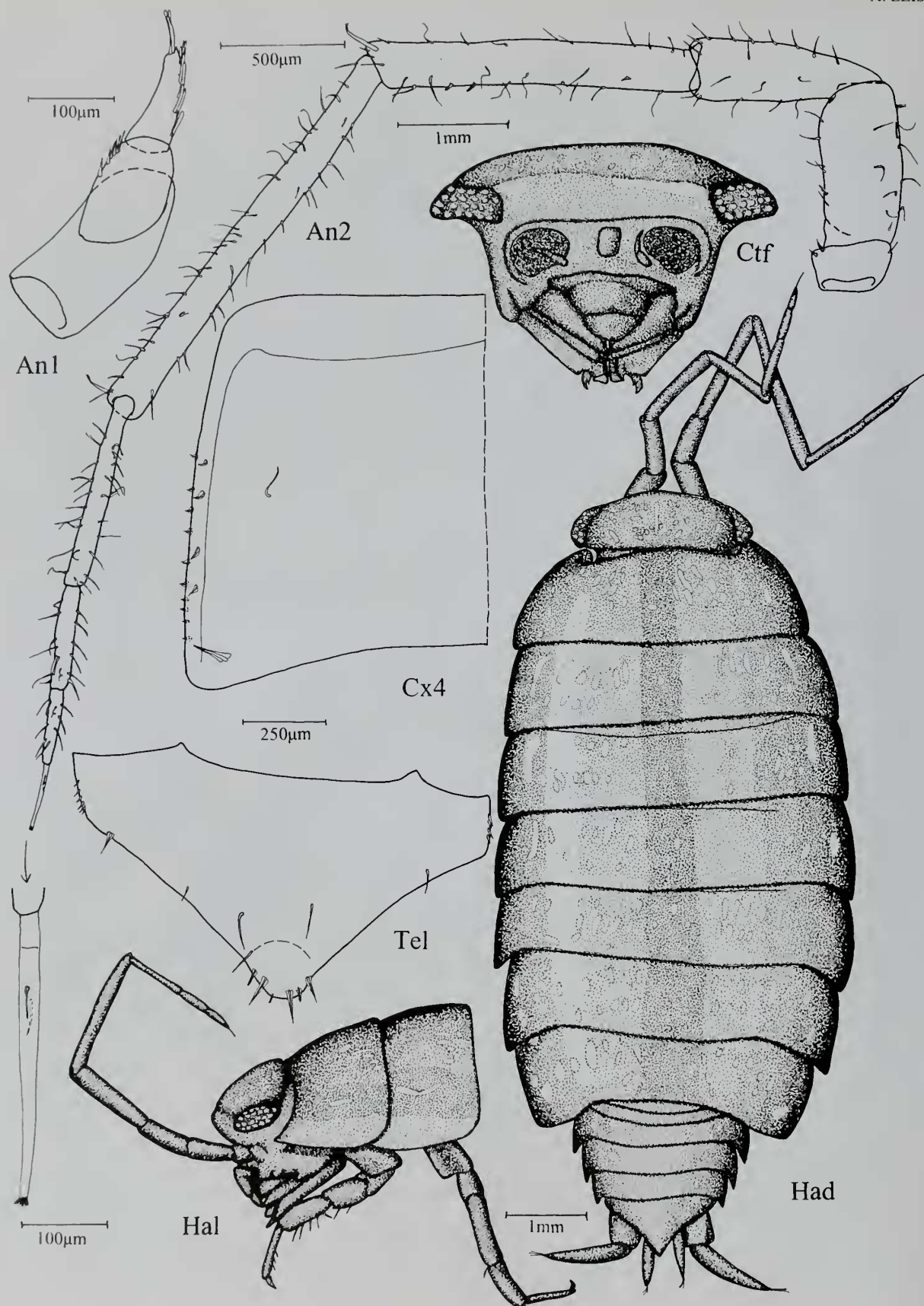


Fig. 21 *Ischioscia trifasciata* sp. nov. Holotype, male 13 mm. An1 antennula; An2 antenna with detail of apical organ; Ctf cephalothorax in frontal view; Cx4 coxal plate 4; Had habitus in dorsal view; Hal habitus in lateral view; Tel pleotelson.

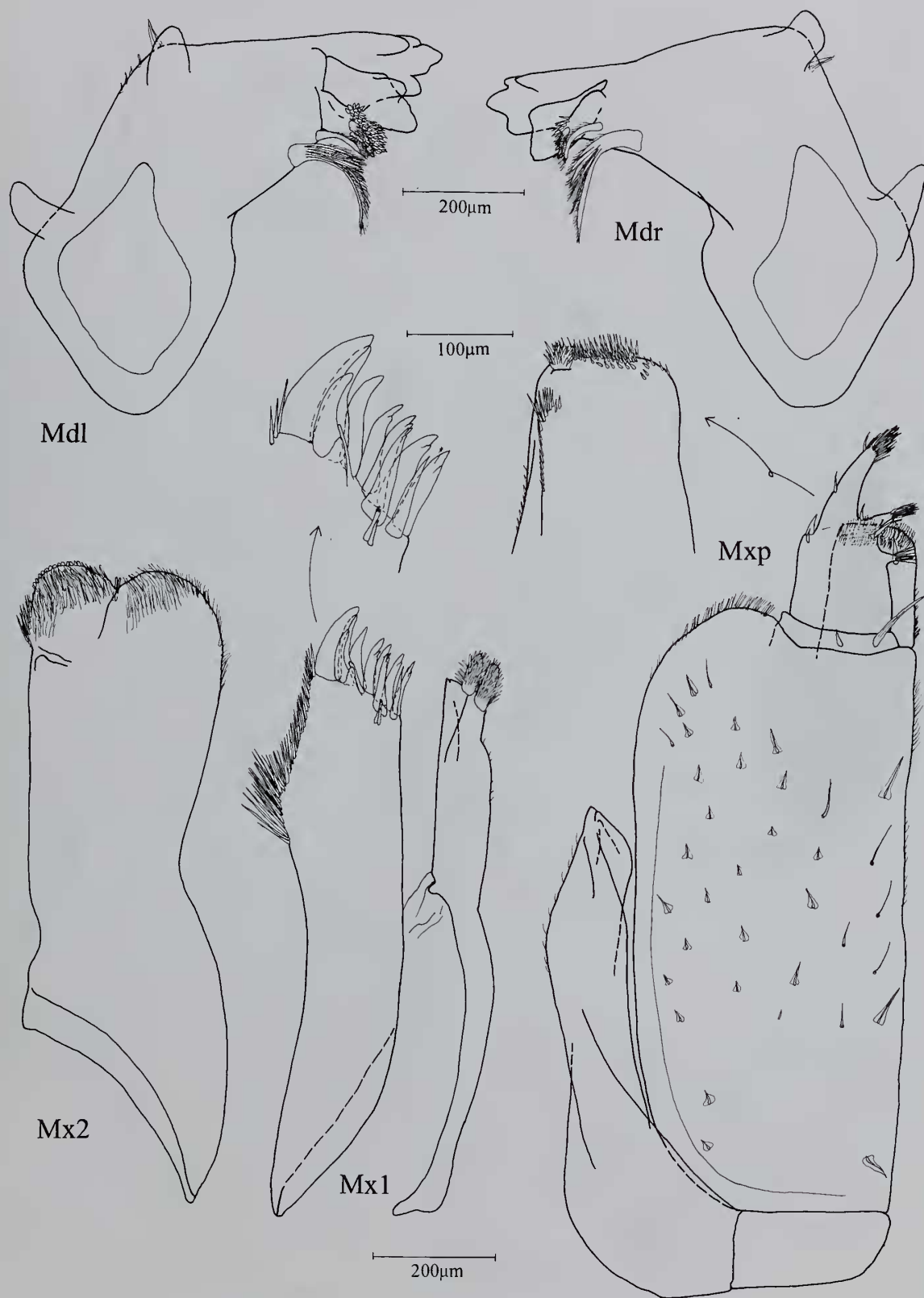


Fig. 22 *Ischioscia trifasciata* sp. nov. Holotype, male 13 mm. Mdl/r left and right mandible; Mx1 maxillula with detail of apex of lateral endite in rostral view; Mx2 maxilla in rostral view; Mxp maxilliped, with detail of endite in rostral view.

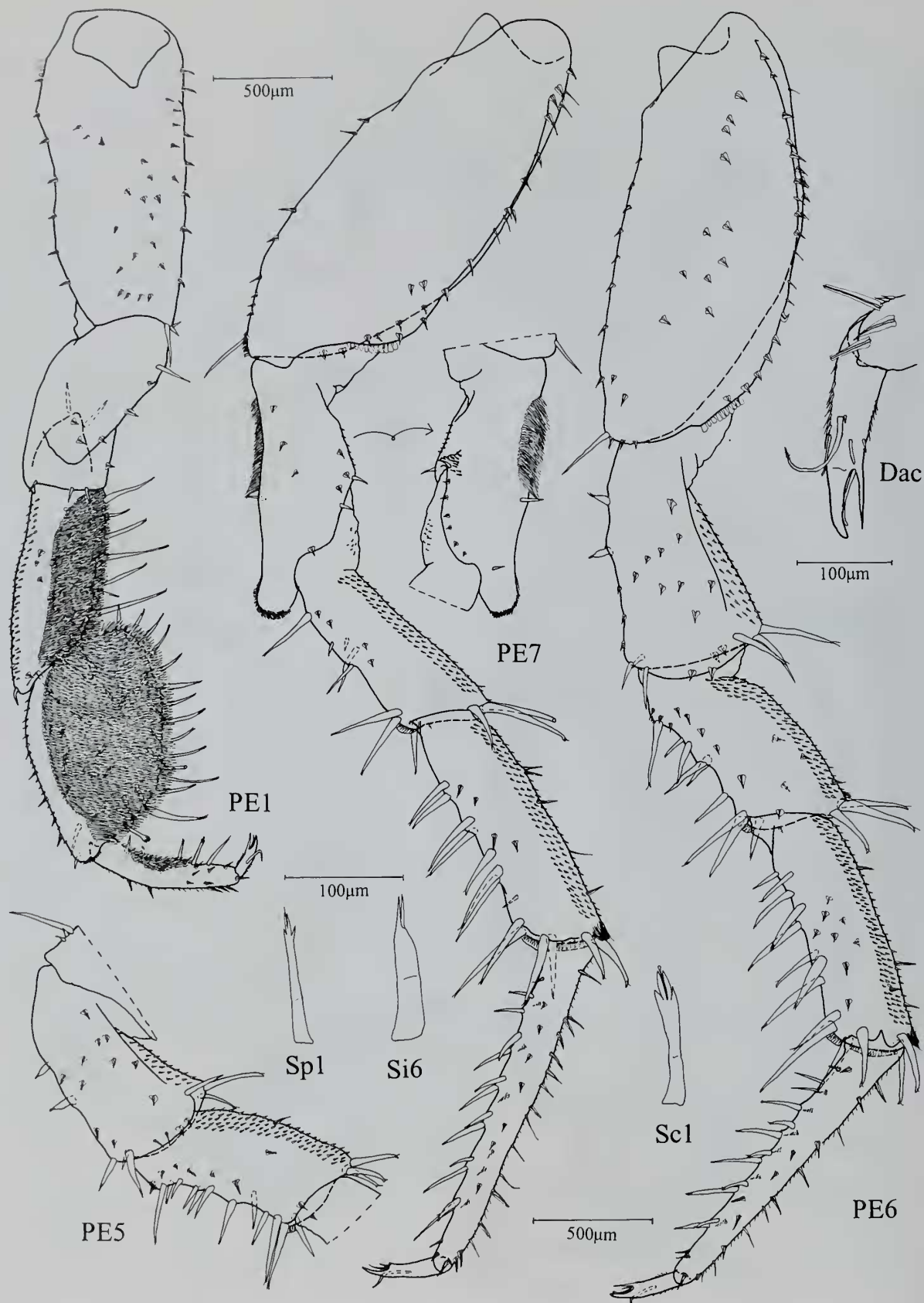


Fig. 23 *Ischioscia trifasciata* sp. nov. Holotype, male 13 mm. Dac dactylus 1 in rostral view; PE1 pereopod 1 in rostral view; PE5–7 pereopods 5 to 7 in caudal view, ischium 7 in rostral view; Sc1 ornamental sensory spine of carpus 1; Si6 sensory spine of ischium 6; Sp1 distalmost sensory spine of propus 1.

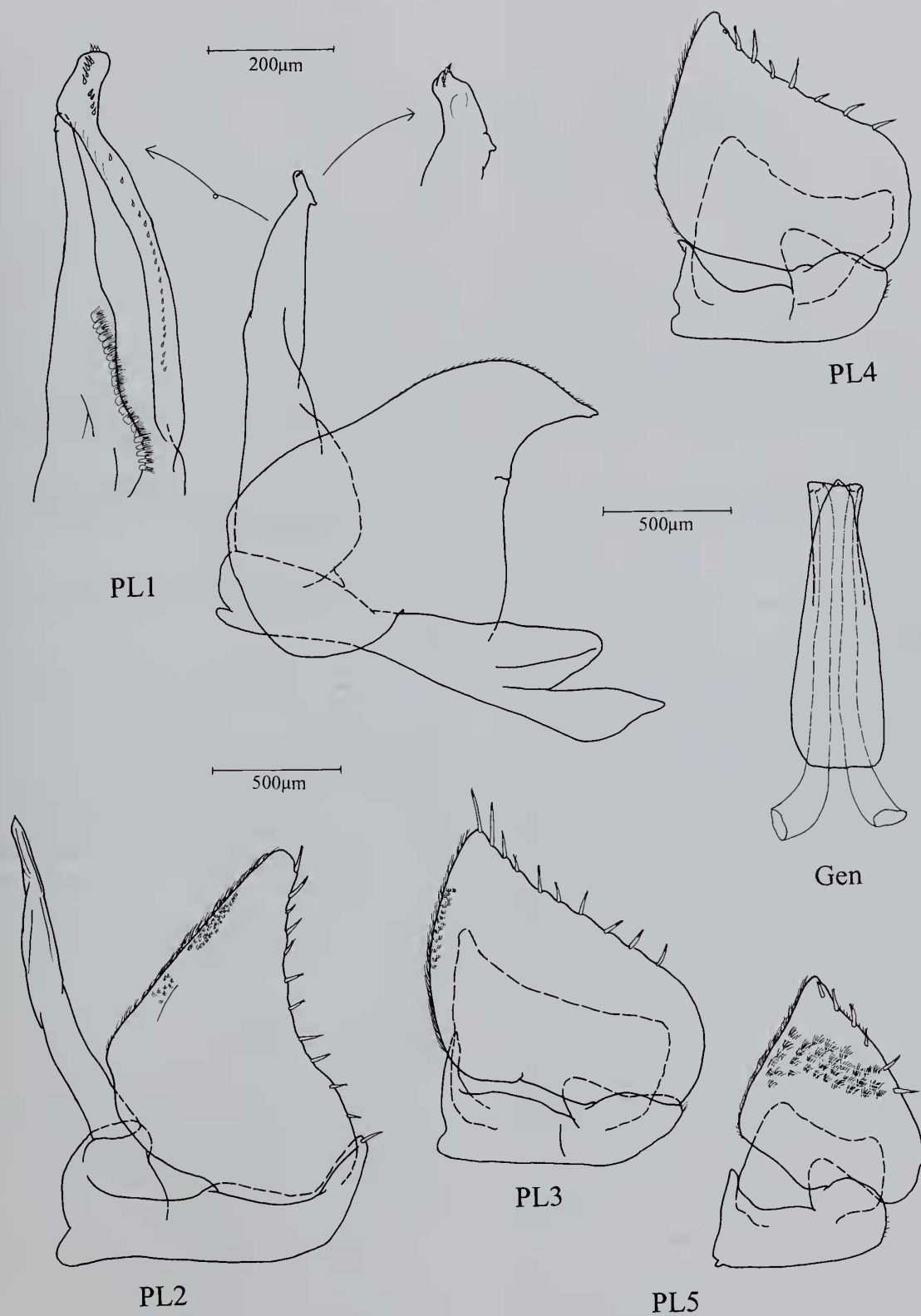


Fig. 24 *Ischioscia trifasciata* sp. nov. Holotype, male 13 mm. Gen genital papilla; PL1–5 pleopods 1 to 5, rostral view, with detail of endopodite 1 in rostral and caudal view.

Pereopods. Slender and long (Fig. 23, PE1–7), dactylus with simple dactylar seta, apically with some rudiments of plumes, long inner claw (Fig. 23, Dac), pereopod 1 carpus with antenna-grooming brush and ornamental sensory spine with hand-like apex (Fig. 23, Sc1), distal sensory spine of basis long. Sexual differentiation. Male pereopods 1 to 3 with setal brushes on propus to merus, carpus enlargement subequal in all 3 pereopods, merus of pereopod 5 and 6 with set of sensory spines of different length, proximal spine of merus 6 on a slight hump, directed distally, pereopod 7 merus medially with proximal sensory spine, two long spines on half length, two shorter ones more proximally, ischium with dense setal brush, medio-distal lobe with dense cover of small cuticular trichiae, rostrally with a slight depression.

Pleopods. Pleopod endopodites slightly bilobate, exopodites with up to 10 sensory spines laterally and minute pectinate scales medially, protopodites 3 to 5 without lateral rudiments of epipodites, no respiratory areas discernible (Fig. 24, PL1–5). Sexual differentiation. Male pleopod 1 exopodite triangular with long lateral point, lateral margin straight, small wrinkle proximally of point, endopodite slender with short subapical protrusion laterally, apex drawn out with 5 spines rostrally, caudally with dense row of spines. Pleopod 2 exopodite with sinuous lateral margin, endopodite with slightly pointed apex.

Uropod. As in generic diagnosis.

Genital papilla. Ventral shield only slightly surpassing terminal spatula (Fig. 24, Gen).

DISCUSSION

Most of the species of *Ischioscia* Verhoeff, 1928 found in Venezuela belong into the vicinity of the well-known *I. variegata* (Dollfus, 1893). For a detailed description of this species cf. Leistikow (1997). *I. fasciifrons* sp.nov. is distantly related to the others; it differs in the lack of a setal brush on the male pereopod 7 ischium which bears a transverse furrow medio-rostrally instead of this brush, the distal lobe is rather inconspicuous. Another autapomorphy of this species is the simple dactylar seta instead of an apically plumose one. The apex of the male pleopod 1 endopodite is obtuse with a set of very small spines terminally, quite distinct from the medio-caudal row of spines, the exopodite is only slightly incised, with a short protrusion. The structure of the male pleopod 1 is similar to *I. colorata* sp.nov. from the coastal region of Caracas, this species differs in the presence of prominent setal fields in the carpus and merus of pereopod 4, merus of pereopod 5 and a setal brush on the ischium of pereopod 7. Thus, *I. colorata* is a member of the *variegata*-group of species as defined by Leistikow (1997). This species is further characterized by the shape of the apex of male pleopod 2 endopodite, which is an autapomorphy for the species. The maxillula bears a single subapical tooth like *I. hirsuta* sp.nov. and *I. fasciifrons* sp.nov., this is in contrast to the two teeth in *I. pariae* sp.nov., *I. guamae* sp.nov., and *I. trifasciata* sp.nov.

In *I. trifasciata*, both teeth are apically serrate while in the others the teeth are acute. Besides, the simplified dactylar seta, the shape of the male pleopod 1 and the setation of male merus 7 are autapomorphies of *I. trifasciata*.

I. hirsuta is characterized by the following derived character states: a long-haired setal brush on male ischium 7, a hand-like subdistal sensory spine of propus 1, and the long tricorn-like setae on the pereonites.

For *I. guamae*, the most distinct character is the setation of the male merus 7, with the four sensory spines all in the proximal half of

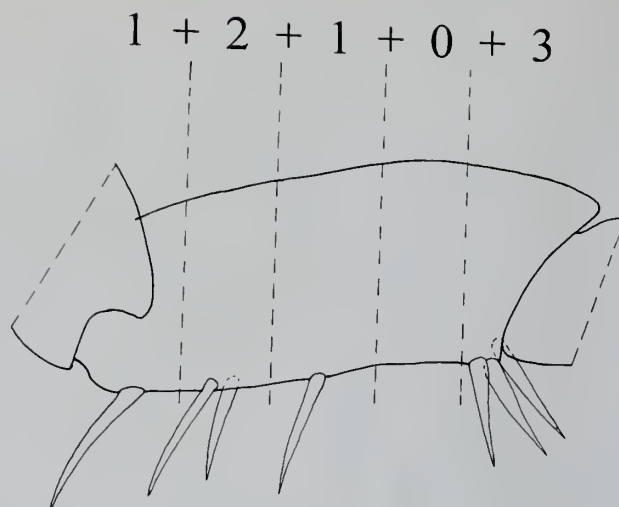


Fig. 25 Schematic drawing of the male merus 7, indicating the position of sensory spines along medial margin in the ground pattern of the *variegata*-group within the genus *Ischioscia* Verhoeff, 1928.

the article, one of the smaller stands alongside the long proximal sensory spine. Another autapomorphic character is the caudolateral position of the remainder of the row of spines on the male pleopod 1 exopodite.

The autapomorphies for *I. pariae* are the peculiar shape of the dactylar seta with club-like apex instead of the feathery one, and the reduction of the number of sensory spines on the male merus 7 to three along the medial border.

The setation of the male merus 7 allows easy recognition of the Venezuelan species of *Ischioscia*. In the ground pattern of the male merus 7, the arrangement of sensory spines along the medial margin from proximally to distally is a long proximal one, two smaller ones distally of the former, another sensory spine even more distally and then a gap which is terminated distally by the medio-distal set of about three long sensory spines, described by the formula $[1+2+1+0+3]$ which can be found in e.g. *I. martiniae* Leistikow, 1997, *I. plurimaculata* Leistikow, 1999 or *I. bolivari* Vandel, 1968 (fig. 25). This formula is varying in the different species of Venezuela as follows:

<i>I. hirsuta</i>	$[1+(1+2)+(1+2)+1+3]$
<i>I. colorata</i>	$[1+2+1+1+3]$,
<i>I. pariae</i>	$[(1+1)+0+1+0+3]$
<i>I. guamae</i>	$[(1+1)+1+1+0+3]$
<i>I. trifasciata</i>	$[1+1+3+0+3]$
<i>I. variegata</i>	$[0+(1+1)+0+0+3]$.

I. fasciifrons does not fit this scheme as it differs in other characters as stated above. The position of the long spine alongside a single short one may be a synapomorphy of *I. pariae* and *I. variegata*, this assumption is supported by the similar shape of the genital papilla, which in both species has a long pointed ventral shield – much longer than the terminal spatula with the laterally placed orifices.

From an ecological point of view, the genus *Ischioscia* is adapted to many different types of habitat. The autochthonous habitat is the moist rain forest but the members of this genus have adapted to secondary growth, cattle pastures and other disturbed environments. An interesting behavioural difference has been observed in *I. pariae* and *I. variegata* both of which are capable of jumping. The former was observed to jump about 5 cm; *I. variegata* can jump even wider, up to 20 cm and hence can easily escape predators like spiders and

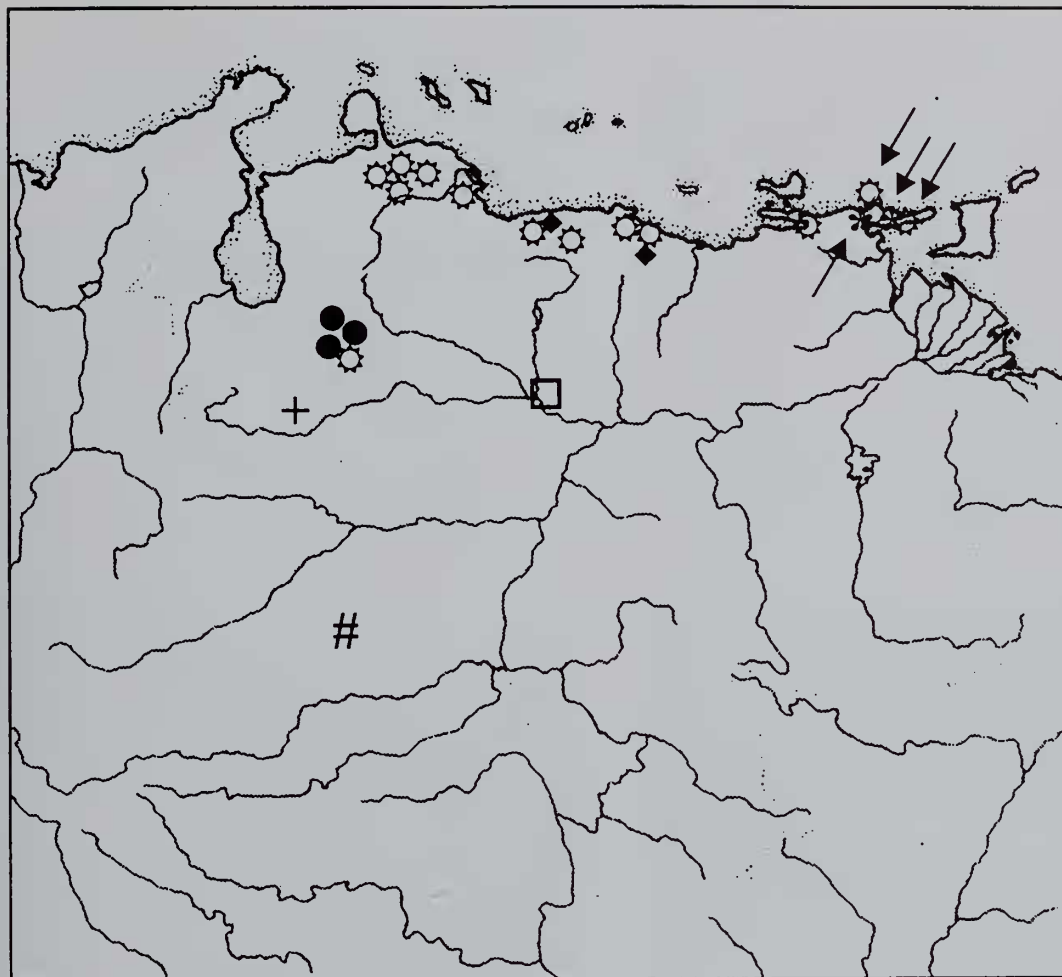


Fig. 26 Distribution of the species of *Ischioscia* Verhoeff, 1928 in Venezuela. □, *I. guamae*; *, *I. pariae*; ♦, *I. colorata*; #, *I. trifasciata*; ●, *I. hirsuta*; +, *I. fasciifrons*; ○, *I. variegata*.

even the astonished human collector. The strong pereopods 6 and 7 with the powerful musculature in the basis are essential for this type of locomotion. The jumping capability may provide another synapomorphy for the two species. Another strategy to escape predators was observed in *I. hirsuta*. A specimen which was observed at the bank of a small brook fled under water and stayed submerged for a considerable period.

These new records widen our knowledge on the genus particularly with respect to their biogeography. The genus is well-distributed in Costa Rica (Leistikow 1999), most records from Venezuela refer to the most abundant species *I. variegata*, which is distributed in the areas adjacent to the Caribbean Sea and also in the interior of Venezuela along the western Corilleras (Fig. 26). The other species seem to have more restricted ranges: *I. pariae* is confined to the Península de Paria; *I. colorata* was found in the vicinity of Distrito Federal. These patchy distributions may be collection artifacts. But they may reflect a characteristic biogeographical pattern found in many Neotropical taxa. Cracraft (1985) argued for the generality of areas of endemism in South America. It is possible to compare distributional data obtained from such diverse taxa as plants (Prance 1982), butterflies (Whitmore & Prance 1986) or birds (Haffer 1974, Cracraft 1985). They all support distinct regions of high endemism called Pleistocene refuges by Haffer (1974). The distribution of species of *Ischioscia* in Venezuela also corresponds to those regions.

I. pariae is found in the Parian centre, *I. colorata* in the Venezuelan Montane centre and *I. hirsuta* in the Meridan Montane centre. The widespread *I. variegata* might be an expansive species best adapted to human habitats, although some of the records may be erroneous (Arcangeli 1930, Richardson 1914). *I. variegata* may occur in close spatial vicinity of a second species of *Ischioscia*, but they were not encountered in exactly the same locality. Thus, effective isolation mechanisms have to be postulated to separate the species.

ACKNOWLEDGMENTS. The author is grateful to Dr. C. Schmidt for permission to analyse the philosciid samples. Moreover, he is indebted to Dr. H. Schmalzfuss, Staatliches Museum für Naturkunde, for the loan of material of *Ischioscia* from the museum's collection.

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